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Oyama et al.

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(45) **Date of Patent: Jun. 29, 2021**

(54) **COMPONENT SUPPLY DEVICE**

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B23P 19/00 (2006.01)
H05K 13/04 (2006.01)
H05K 13/02 (2006.01)

(52) **U.S. Cl.**
CPC ***H05K 13/0419*** (2018.08); ***H05K 13/02*** (2013.01); *Y10T 29/53178* (2015.01)

(58) **Field of Classification Search**
CPC H05K 13/0419; H05K 13/02; H05K 13/0417; Y10T 225/221; Y10T 29/49799;
(Continued)

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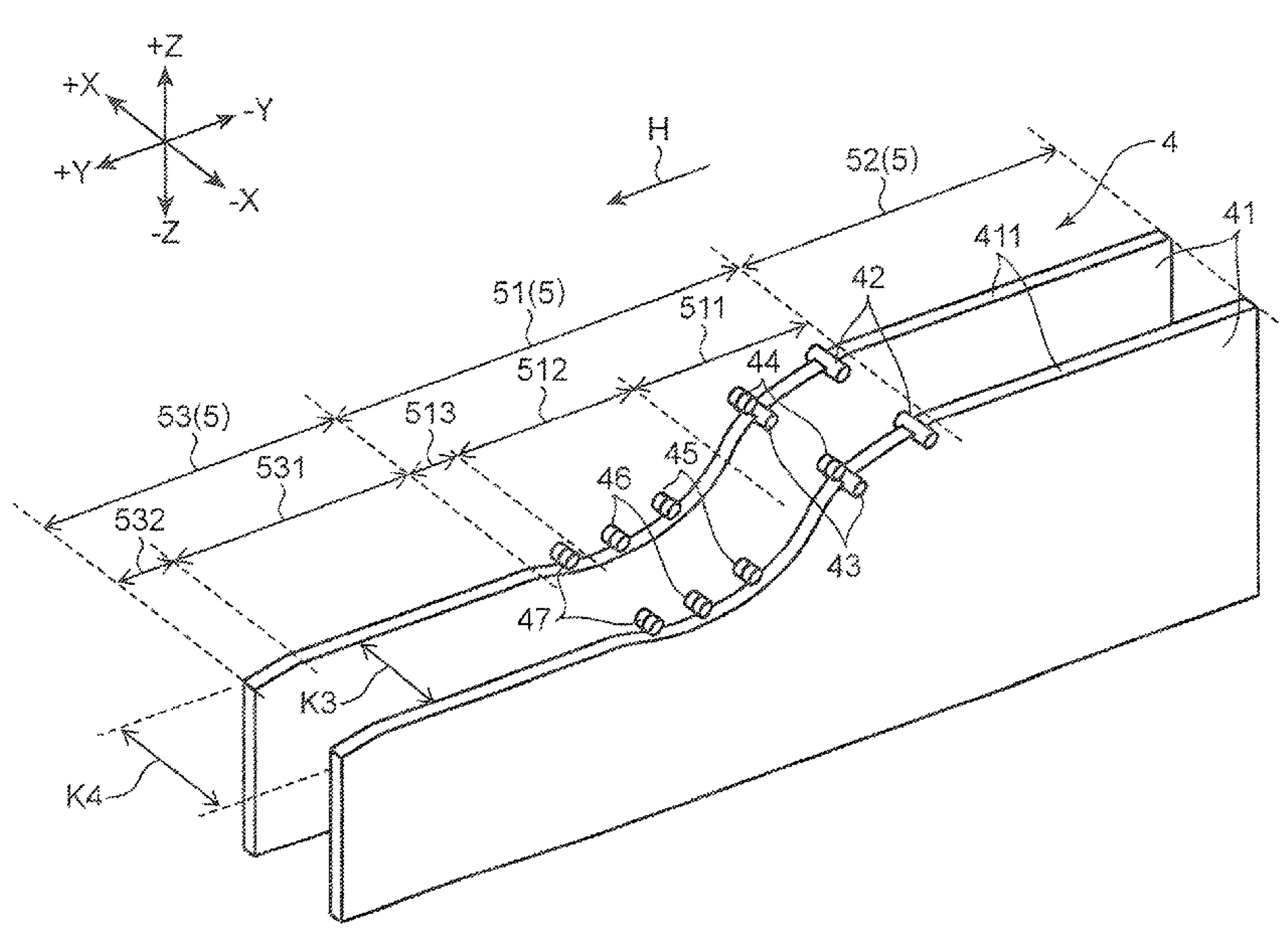
Primary Examiner — Thiem D Phan
(74) *Attorney, Agent, or Firm* — Studebaker & Brackett PC

(57) **ABSTRACT**

A component supply device supplies components stored in a component storage tape to a component extracting position. The component supply device includes a component exposing unit that exposes the components in the component storage tape fed by a tape feeding unit, the component storage tape traveling on a travel path formed from a tape travel path forming unit. The component exposing unit includes a cover tape raising unit that performs a raising process for a cover tape. In the travel path formed from the tape travel path forming unit, a first path part on which the cover tape raising unit is disposed is inclined to one direction side in a Z-axis direction from an upstream side toward a downstream side in a tape feeding direction.

15 Claims, 23 Drawing Sheets



(58) **Field of Classification Search**
CPC Y10T 29/5191; Y10T 29/53174; Y10T 29/53178; B65H 21/00
USPC 29/740, 739, 756, 760, 806, 825, 829, 29/833, 834, 840
See application file for complete search history.

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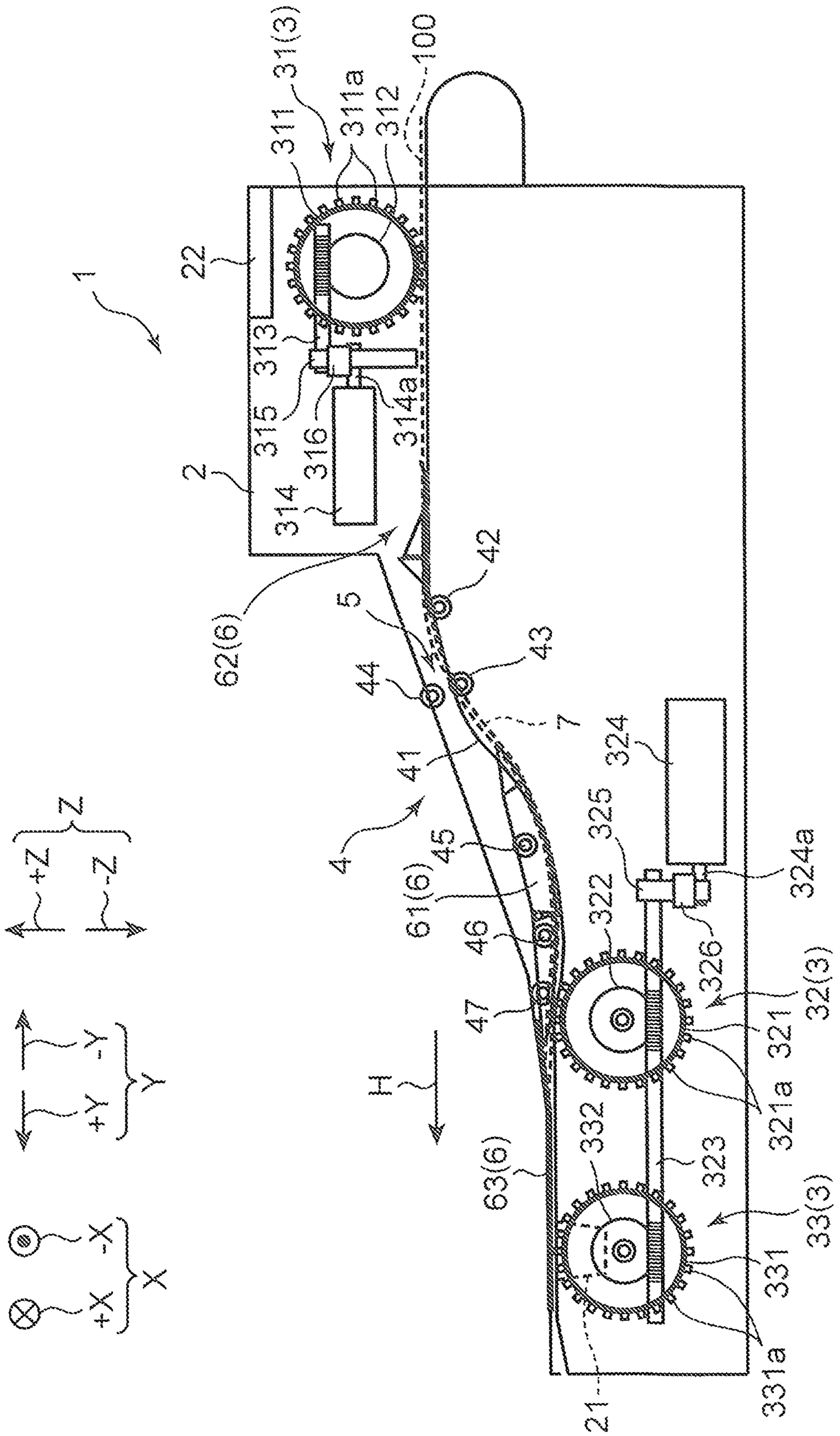
FIG. 1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22
2
311
31(3)
311a
312
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313
315
316
314
314a
62(6)
5
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44
43
41
7
4
45
61(6)
46
47
324
325
322
326
324a
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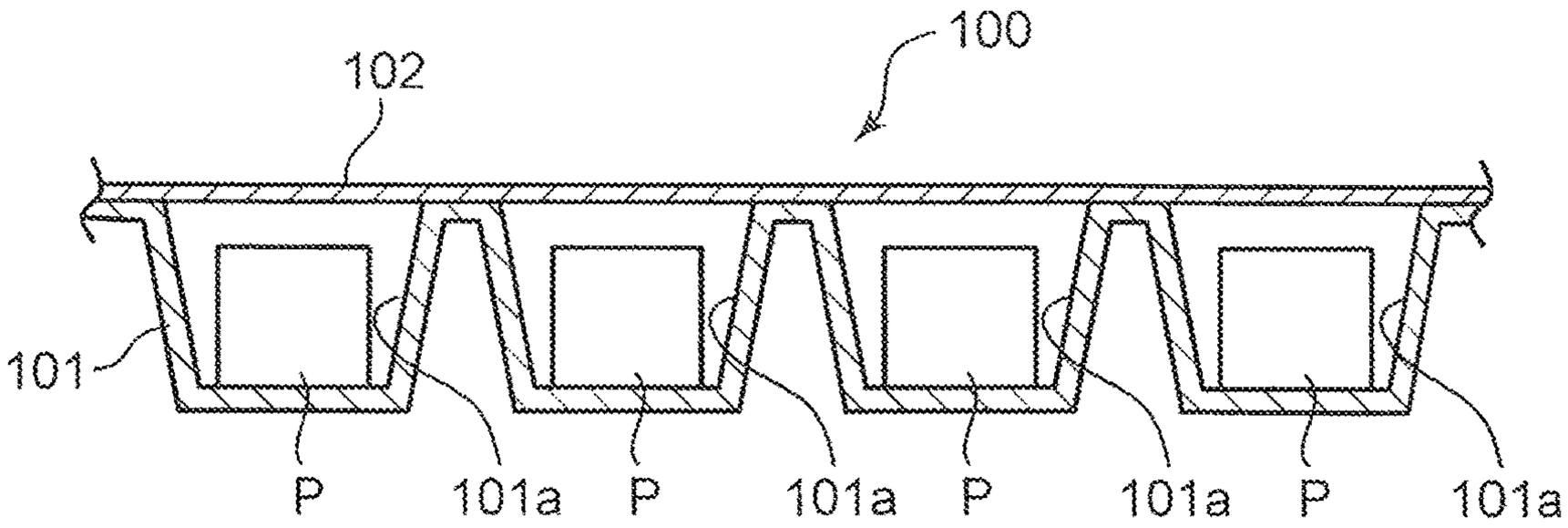
321a
323
332
331
331a
63(6)
33(3)
32(3)
21
H
+Z
-Z
Z
+Y
-Y
Y
+X
-X
X

FIG.2A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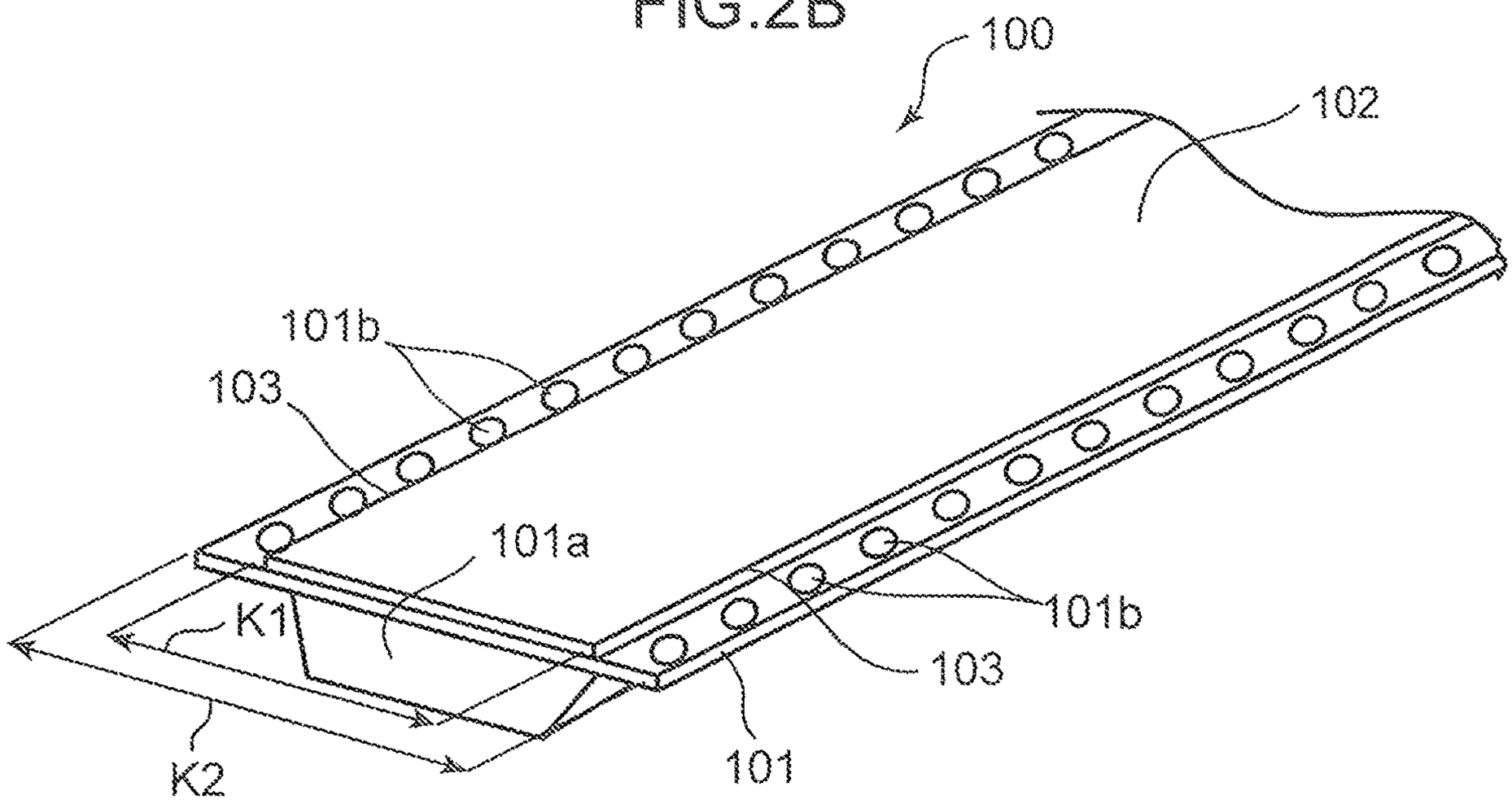
P
101a
P
101a
P
101a
P
101a

FIG.2B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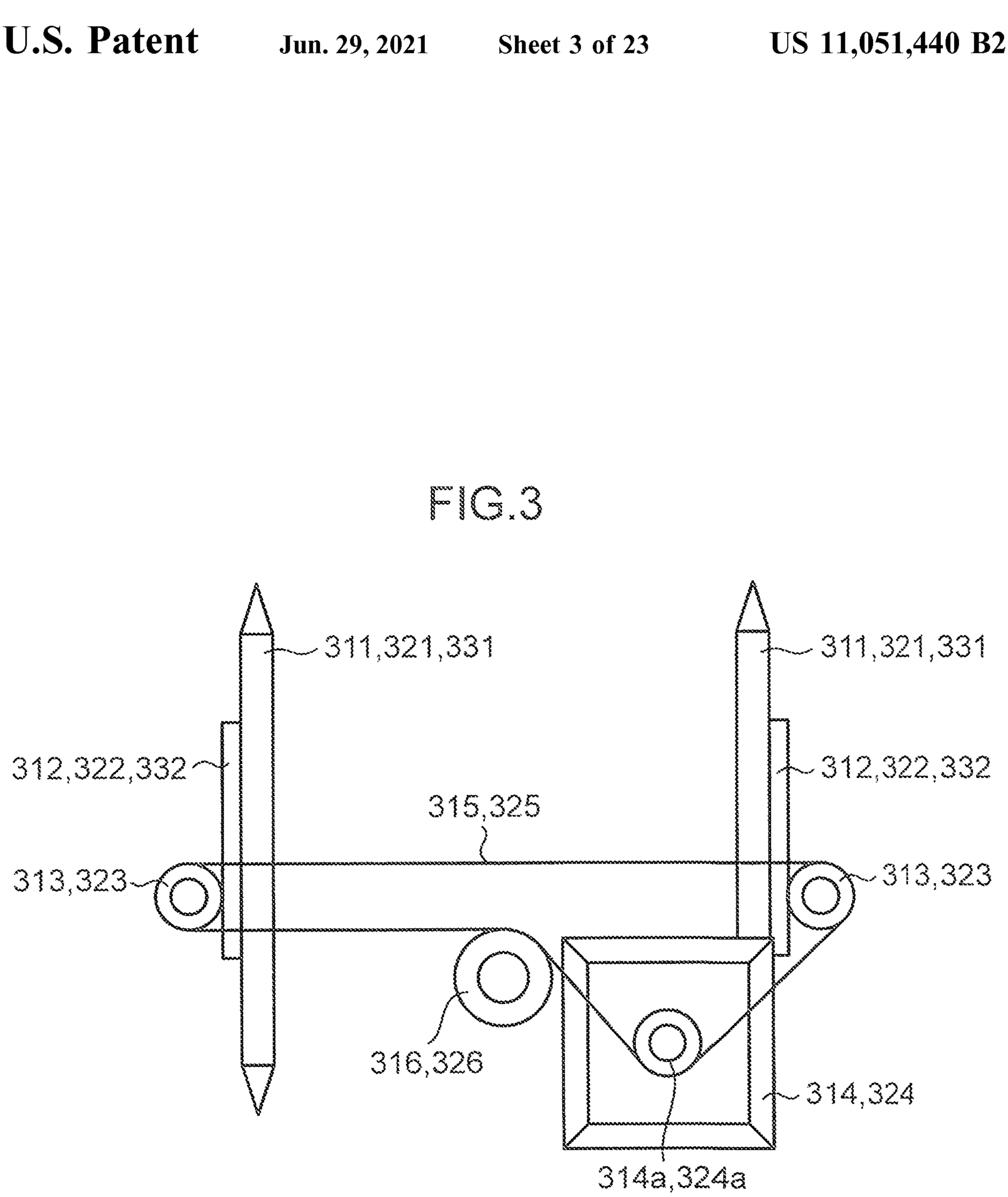
102
101b
103
101a
K1
K2
101
103
101b

FIG.3


311,321,331
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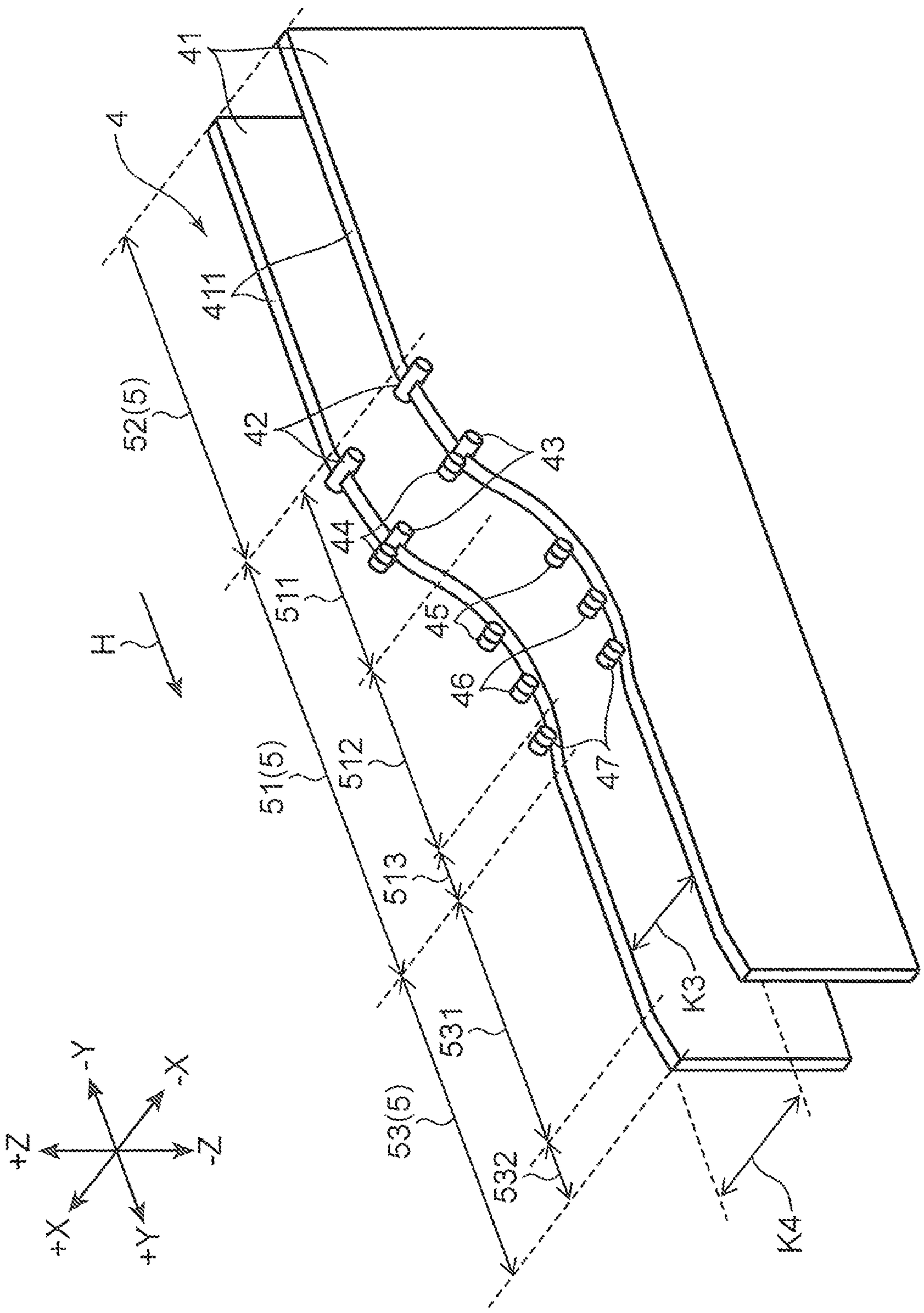
312,322,332
312,322,332
315,325
313,323
313,323
316,326
314,324
314a,324a

FIG. 4


41
4
411
52(5)
42
43
44
511
H
45
46
51(5)
512
47
513
531
K3
53(5)
532
K4
+Z
-Y
-X
-Z
+X
+Y

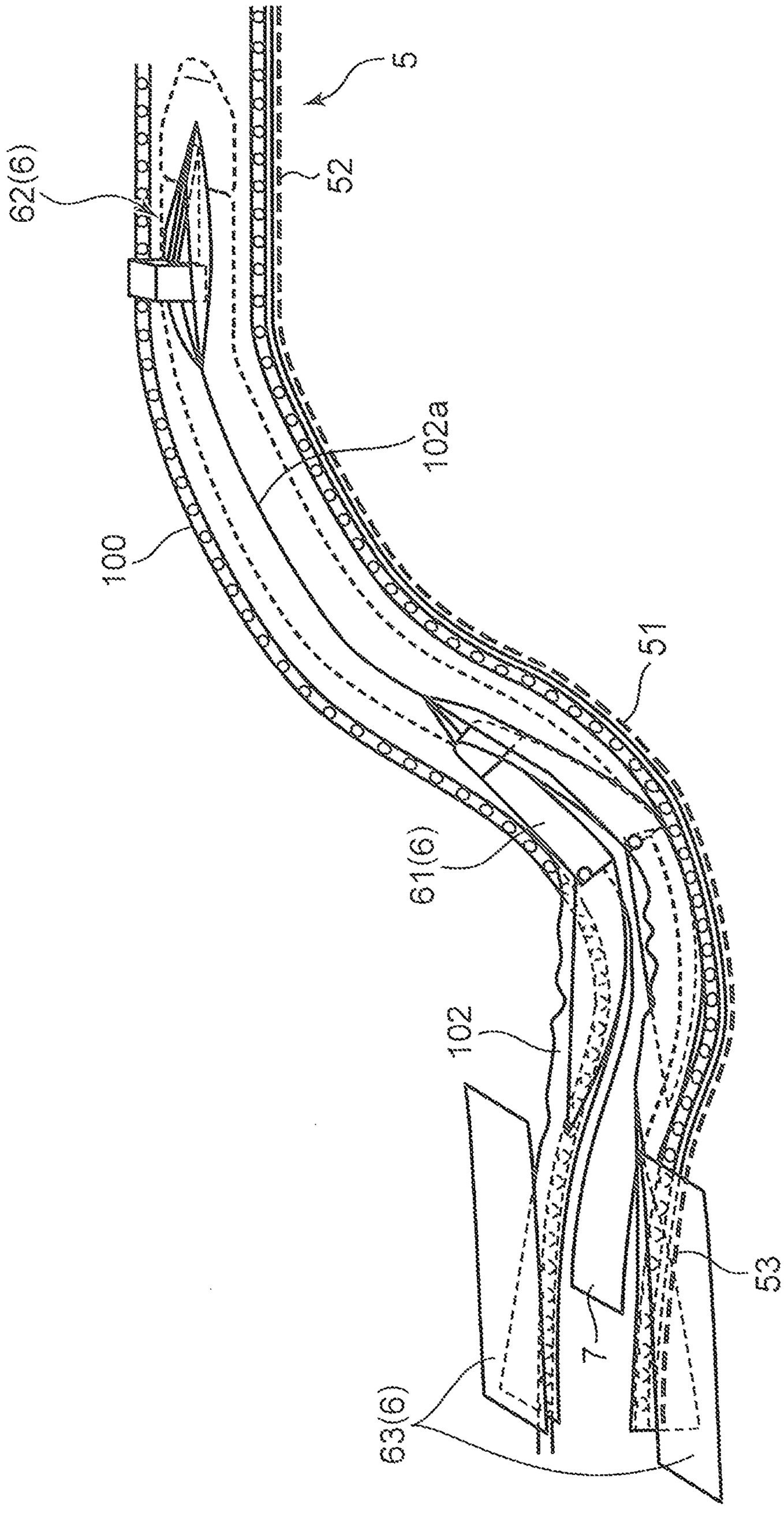
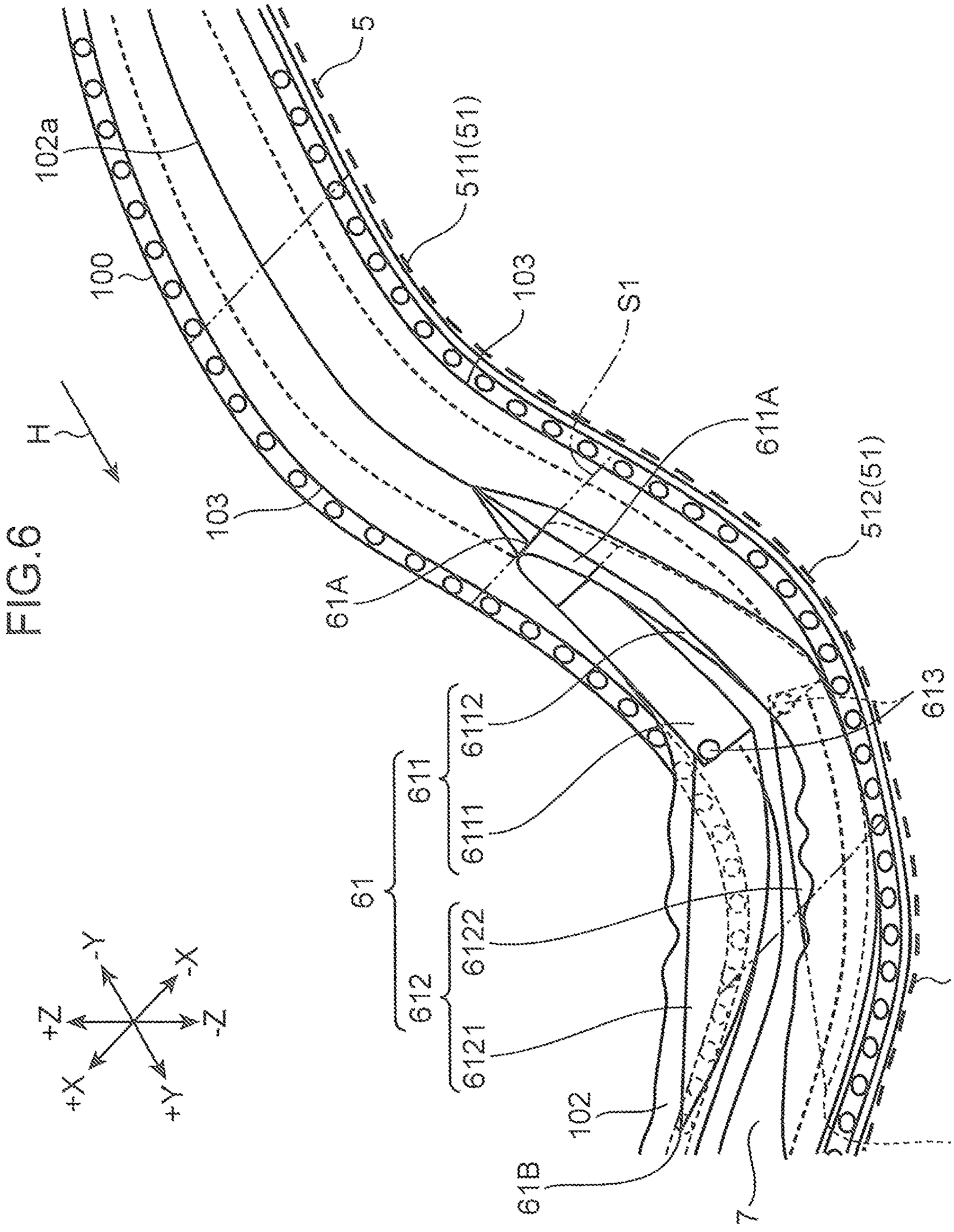


FIG. 5


102a
100
H
103
61A
5
511(51)
S1
611A
512(51)
613
611
6111
6112
612
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61B
102
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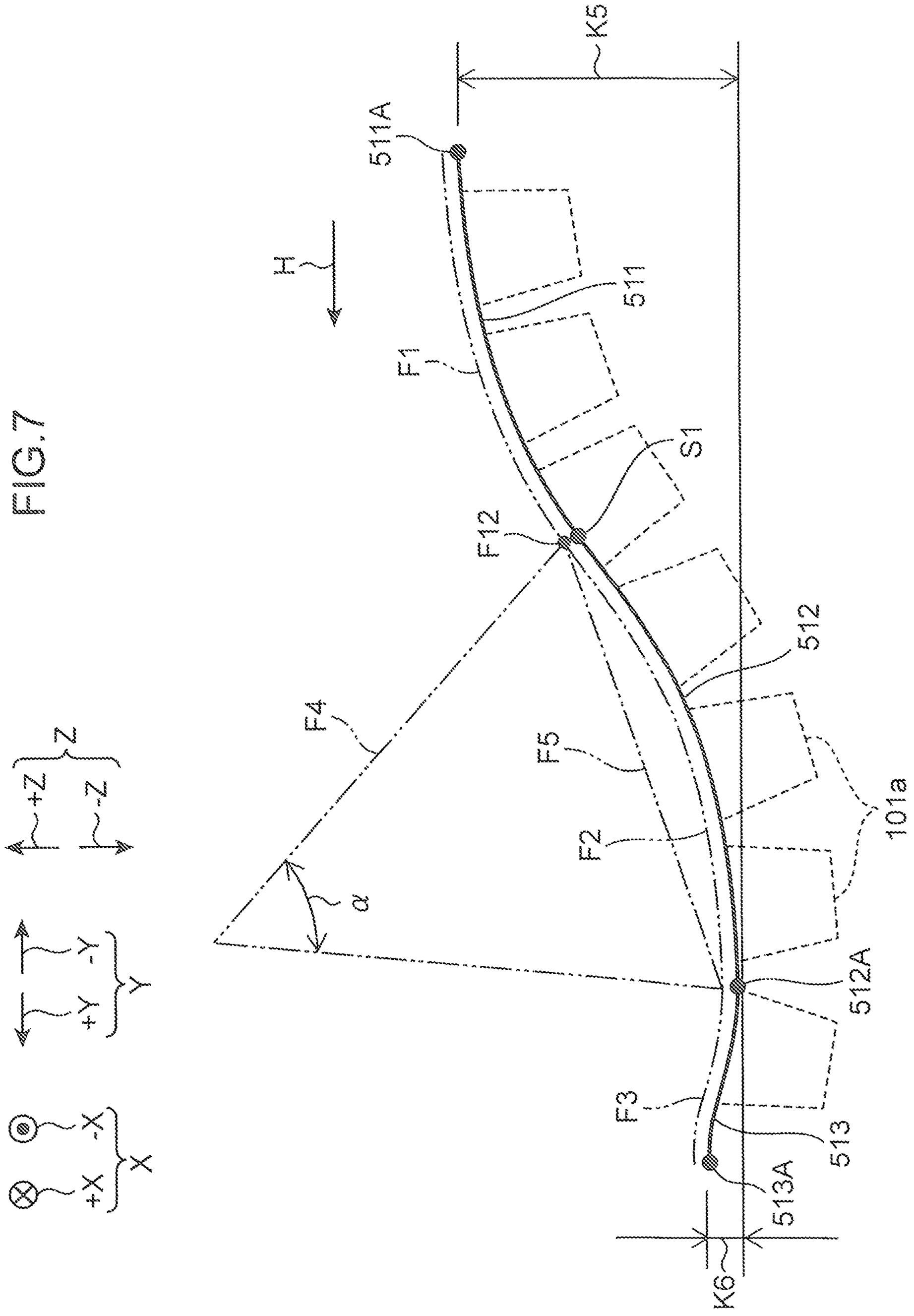
+Z
-Z
+X
-X
+Y
-Y

FIG.6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511A
H
511
F1
S1
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F4
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F2
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α
512A
F3
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K6
Z
+Z
-Z
Y
+Y
-Y
X
+X
-X

FIG.7

FIG.8A

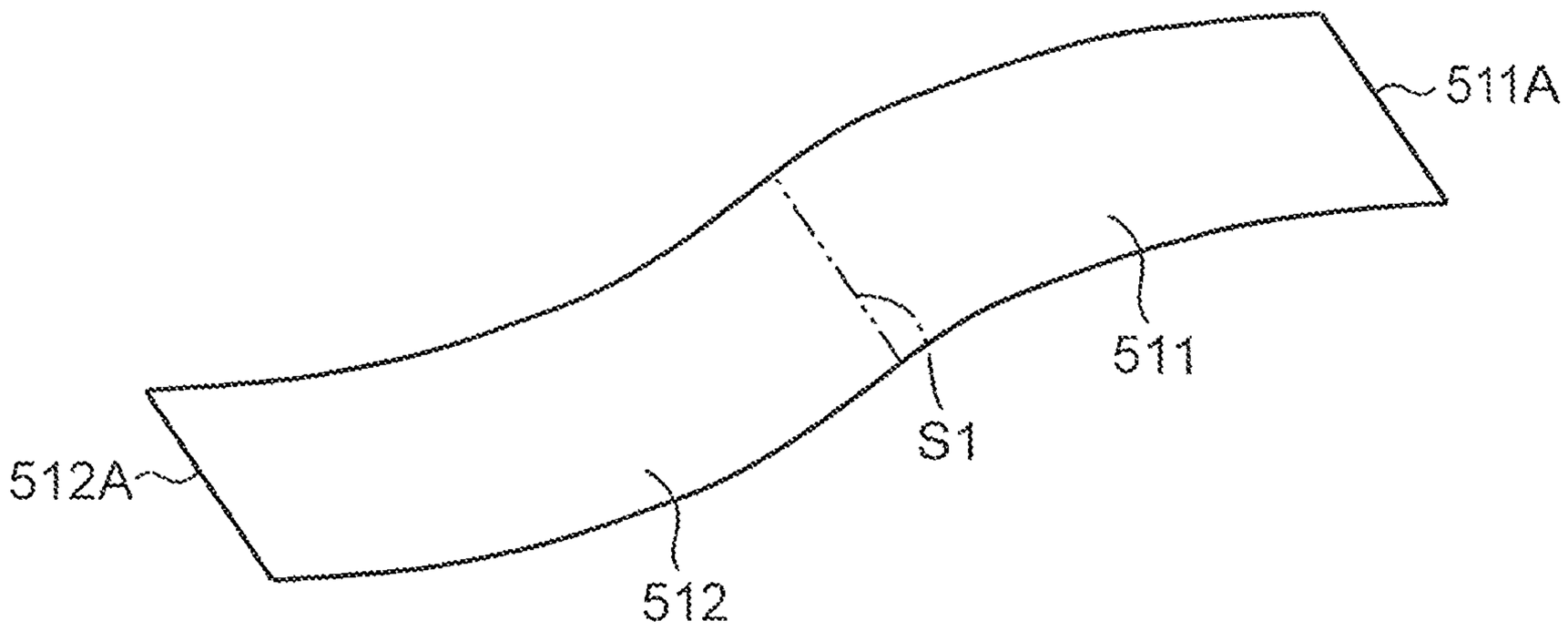


FIG.8B

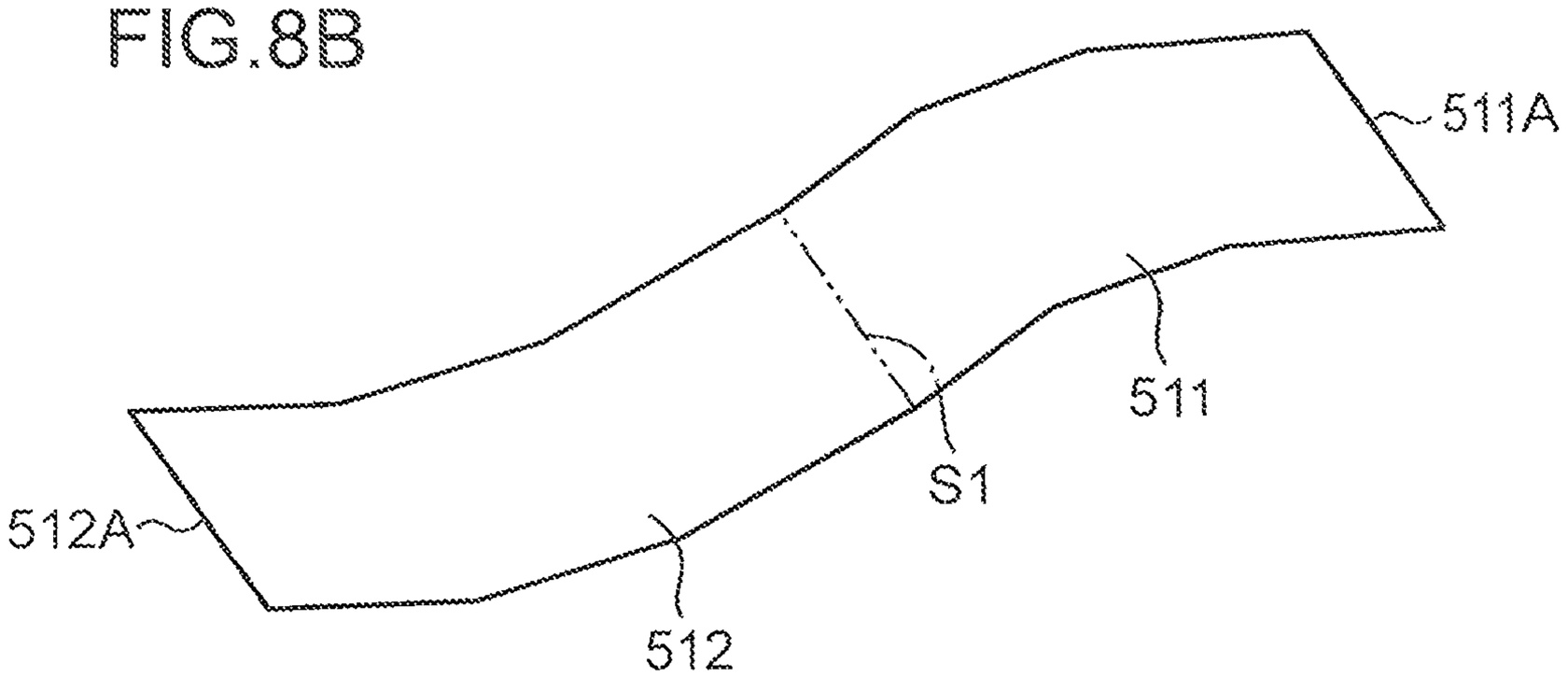


FIG.8C

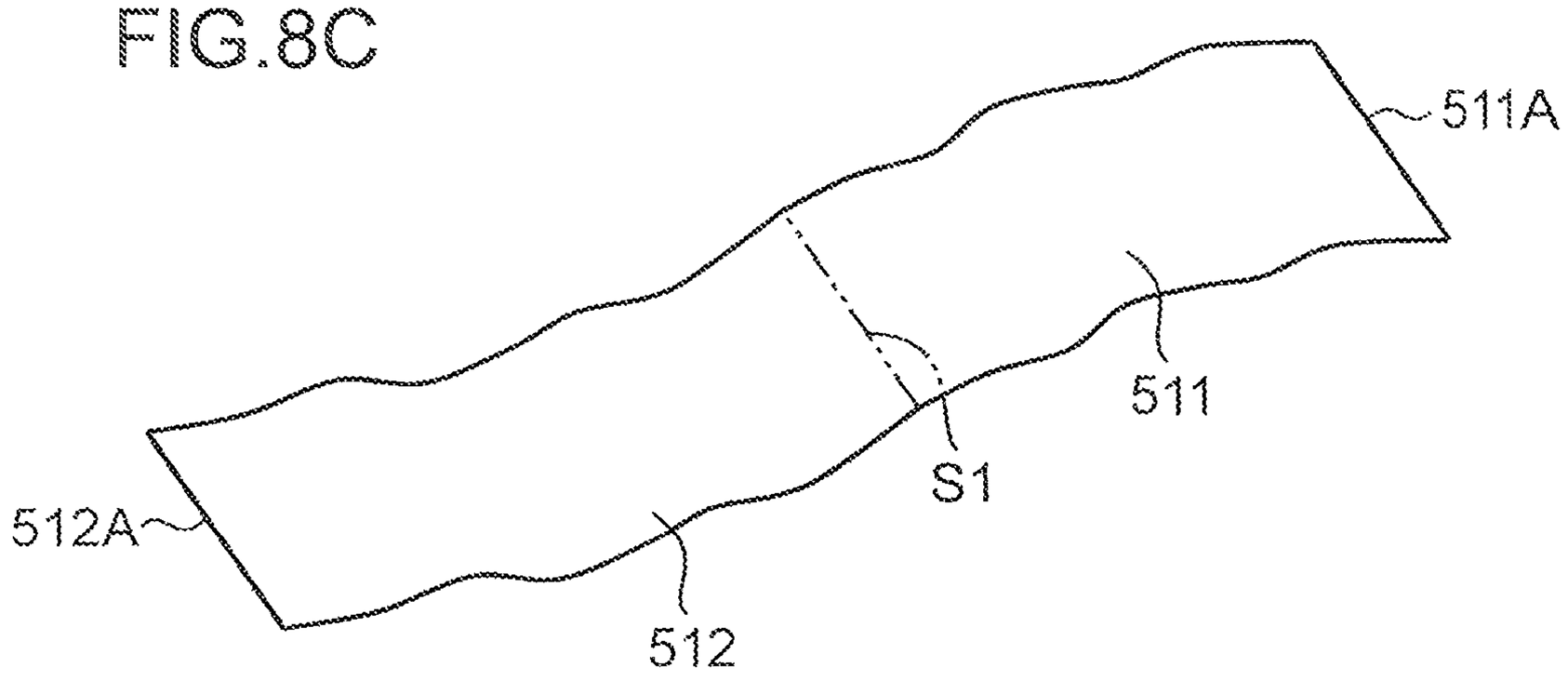
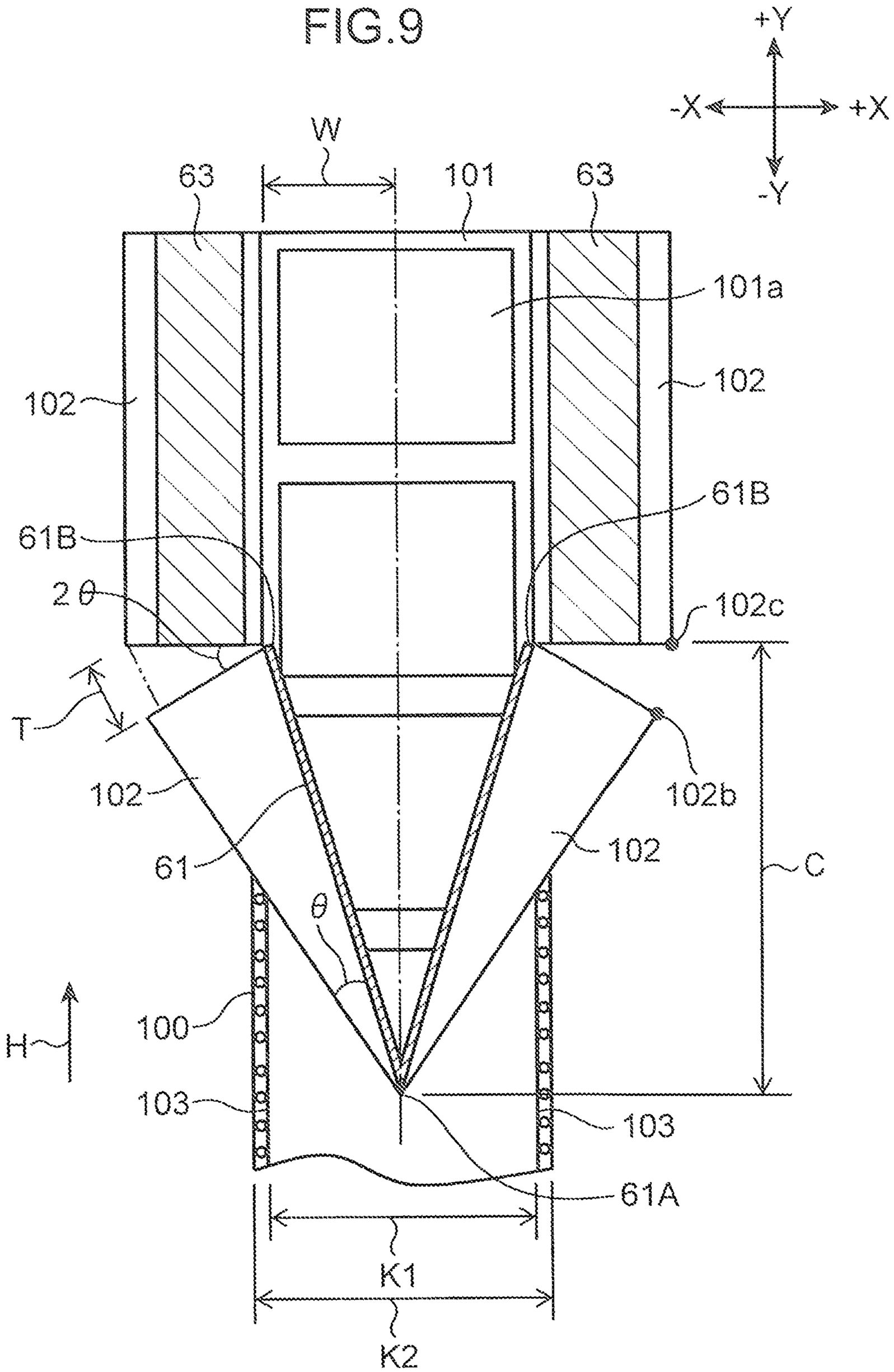


FIG.9


+Y
-X
+X
-Y
W
63
101
63
101a
102
102
61B
61B
2θ
102c
T
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102b
61
102
C
θ
H
100
103
103
61A
K1
K2

FIG.10

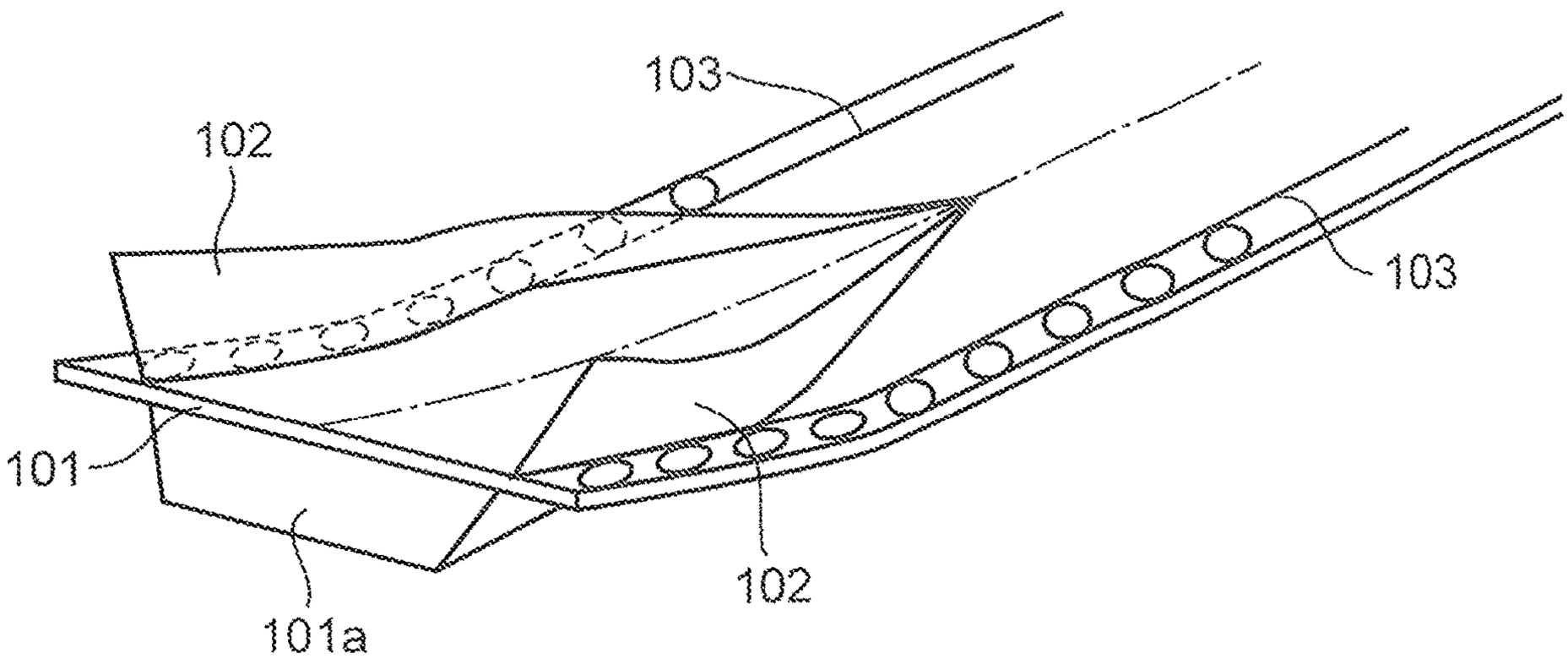


FIG.11A

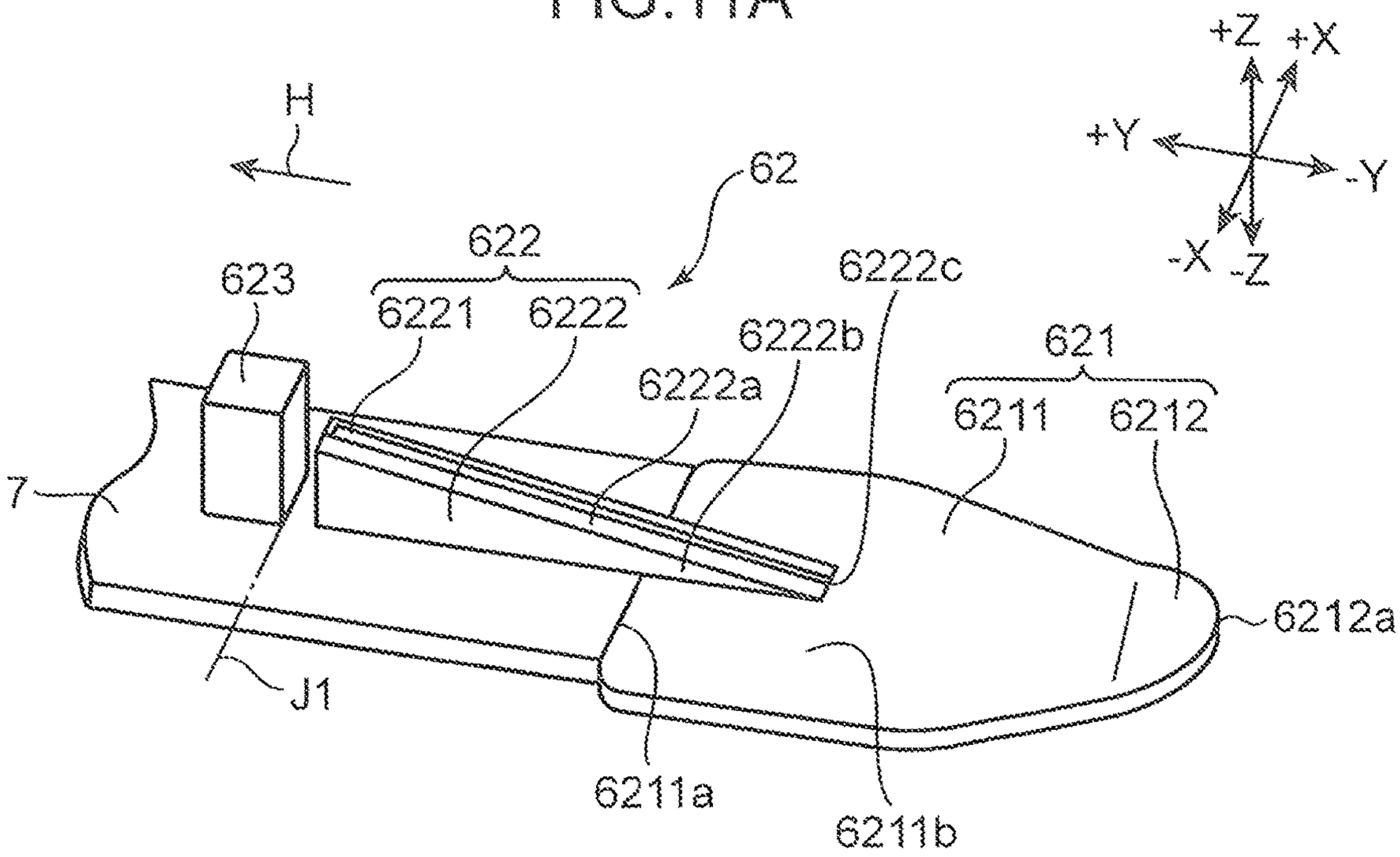


FIG.11B

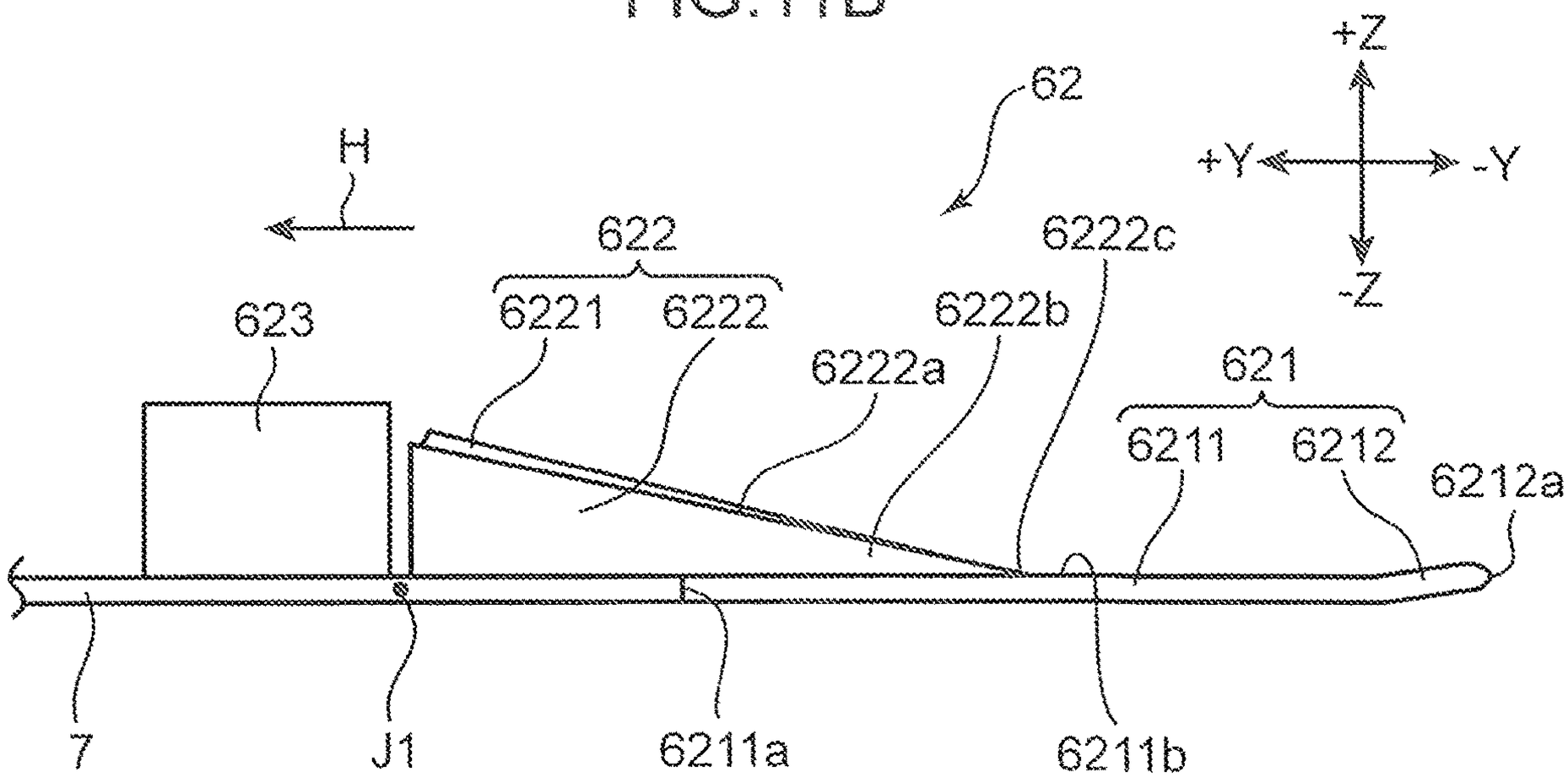
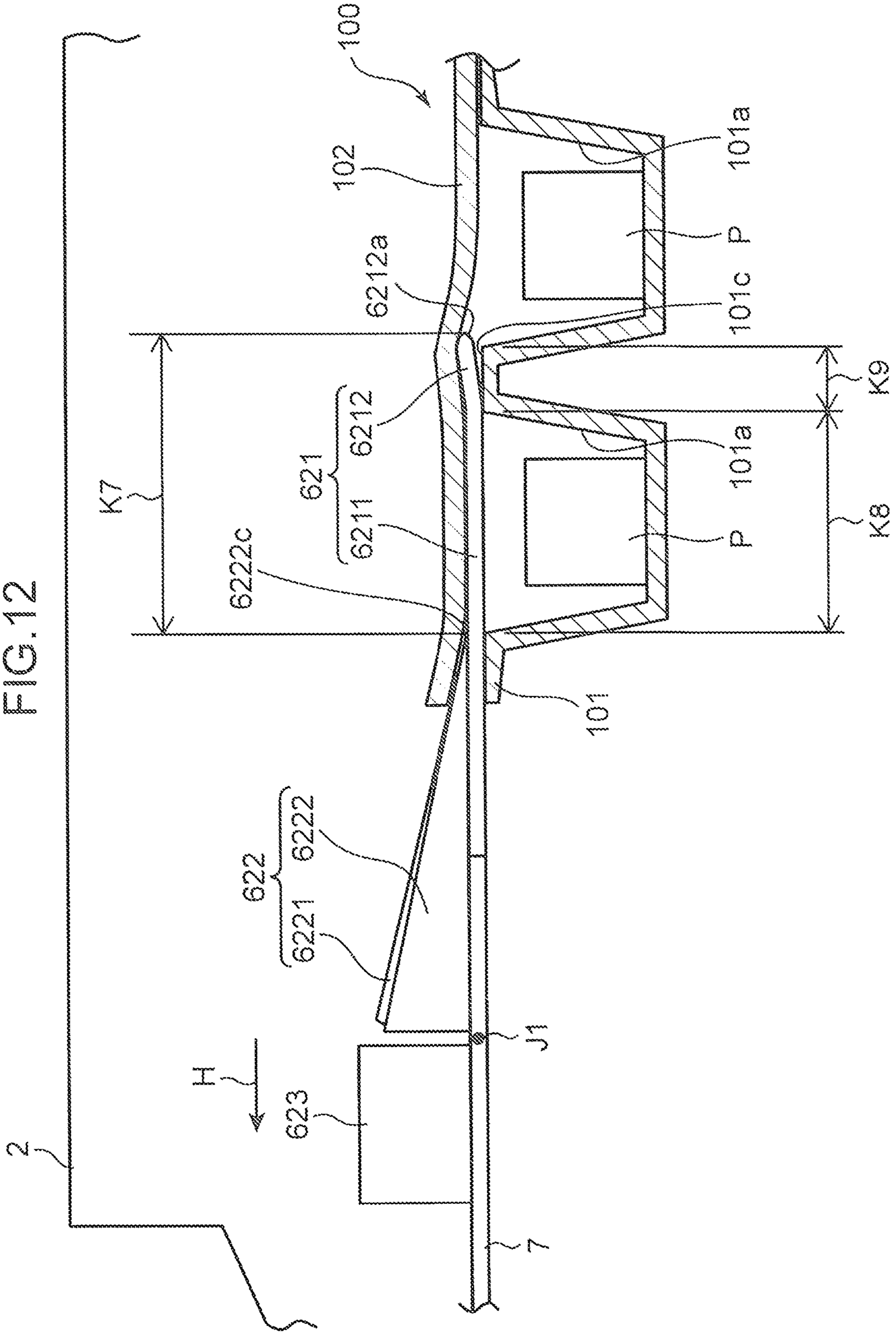


FIG. 12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6212
621
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K7
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K8
101
622
6222
221
J1
H
623
2
7

FIG.13A

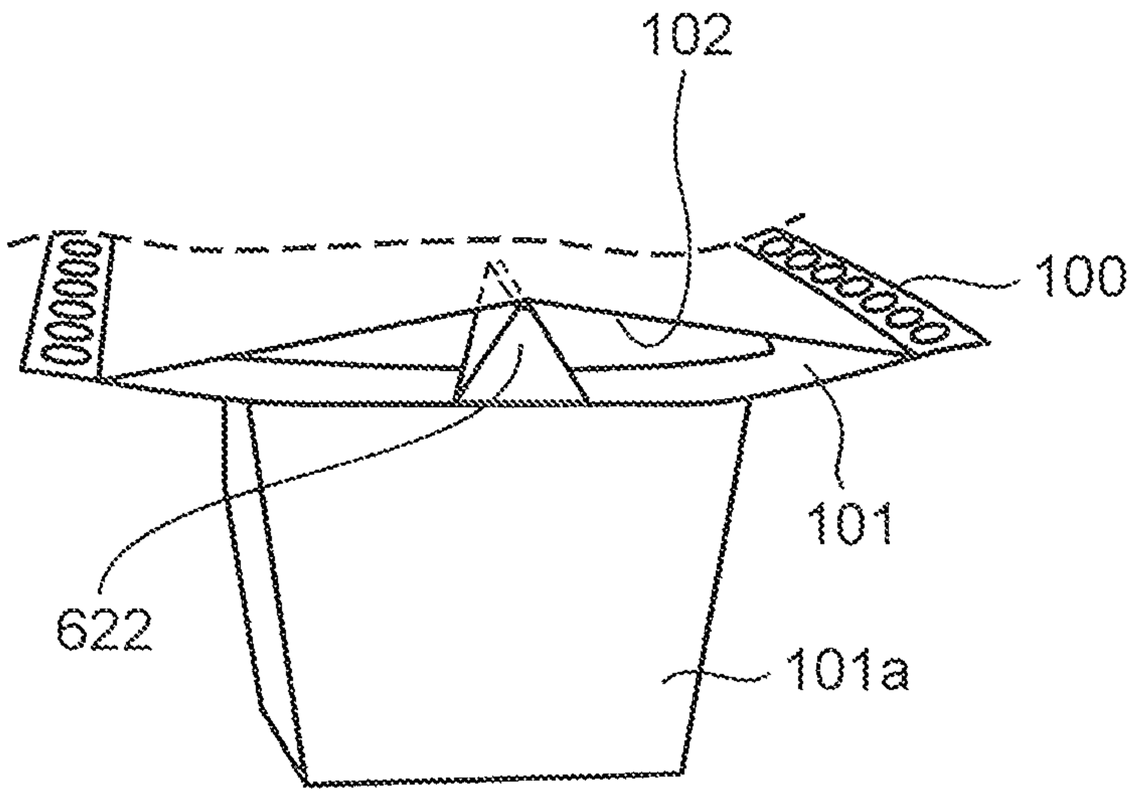


FIG.13B

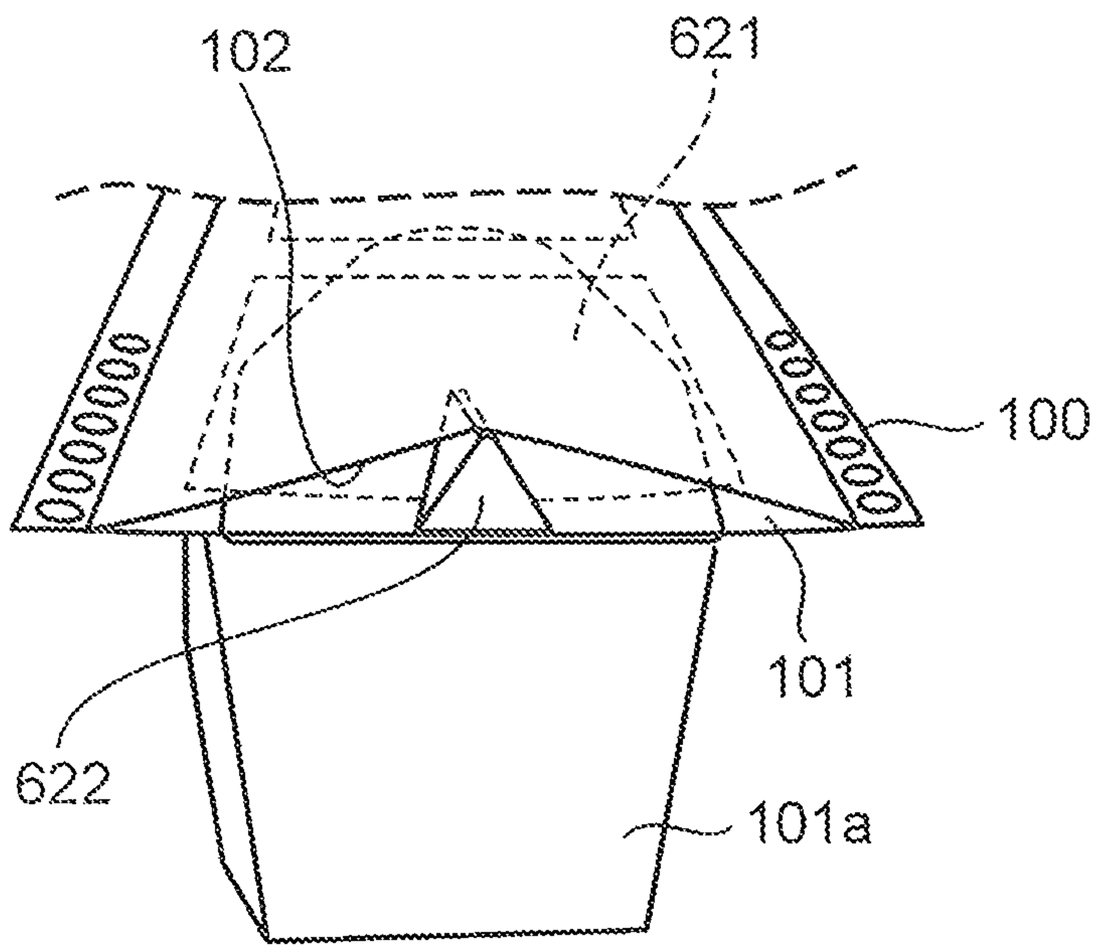


FIG.14A

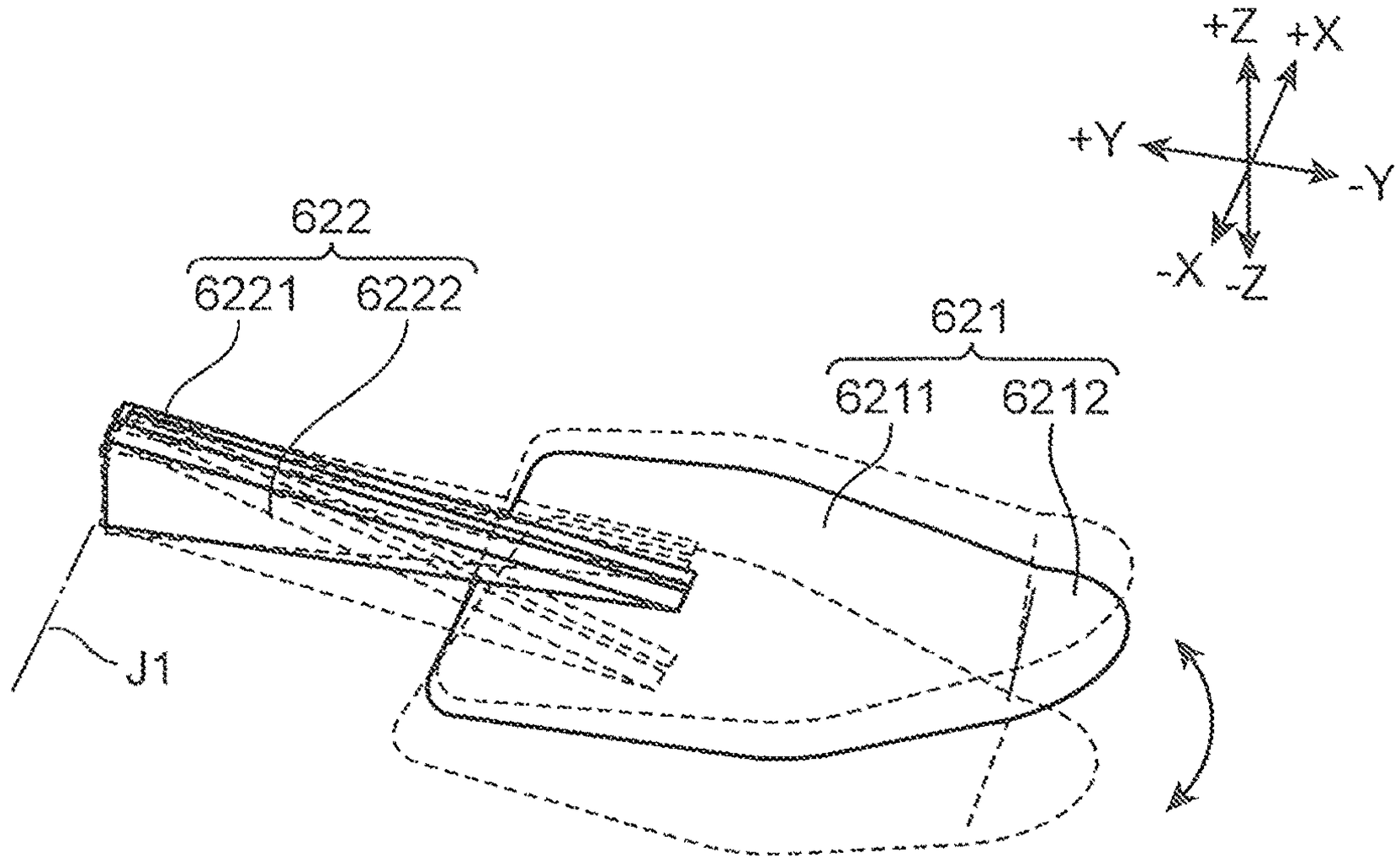


FIG.14B

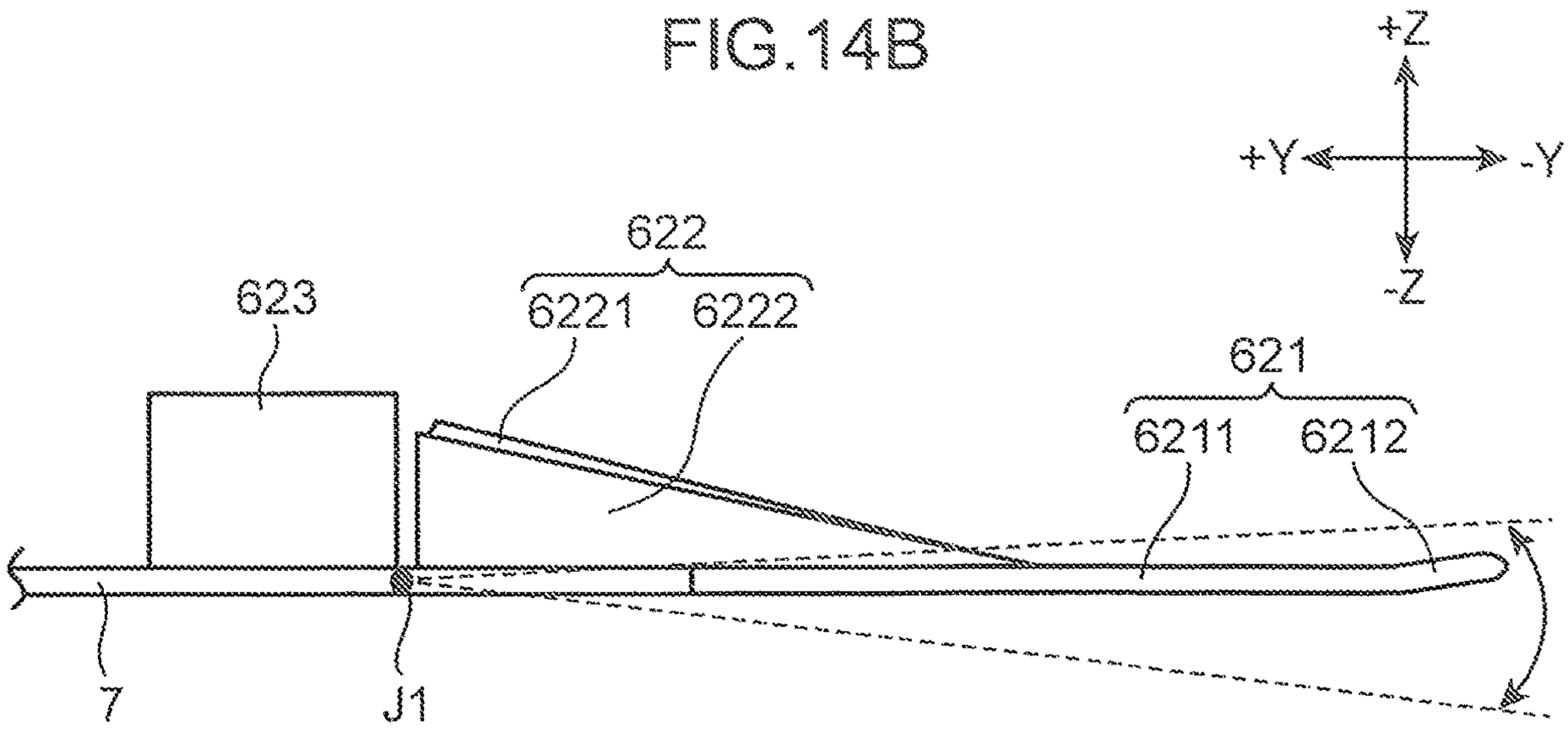
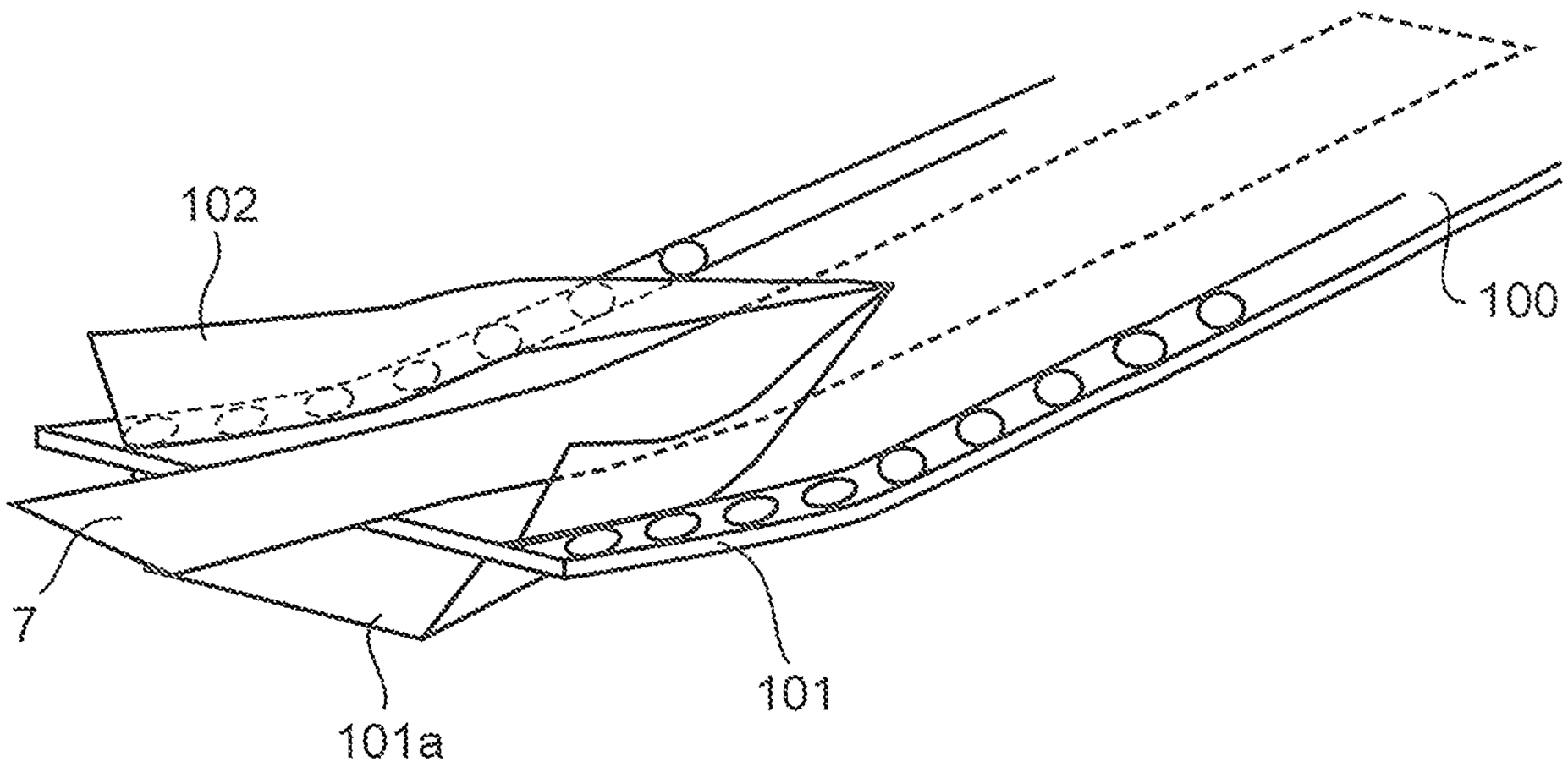


FIG.15



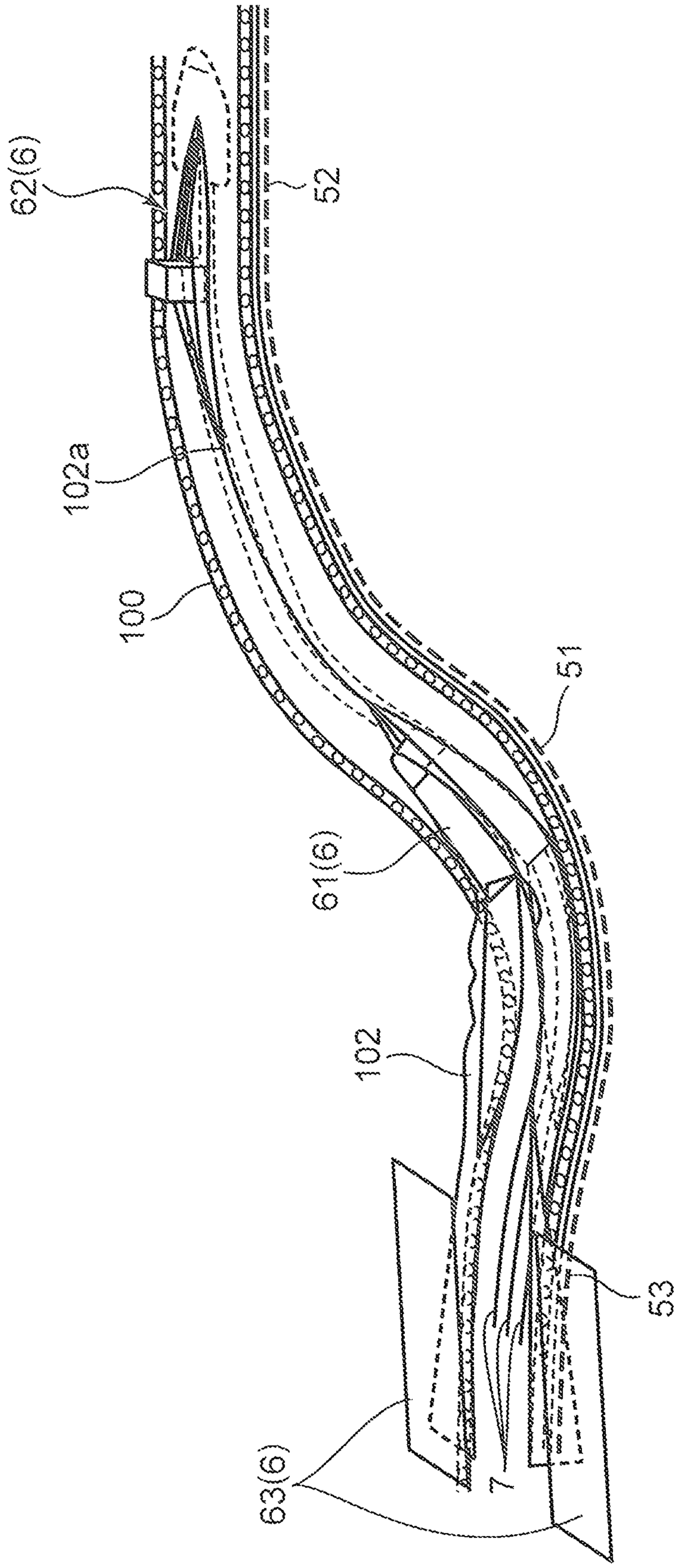
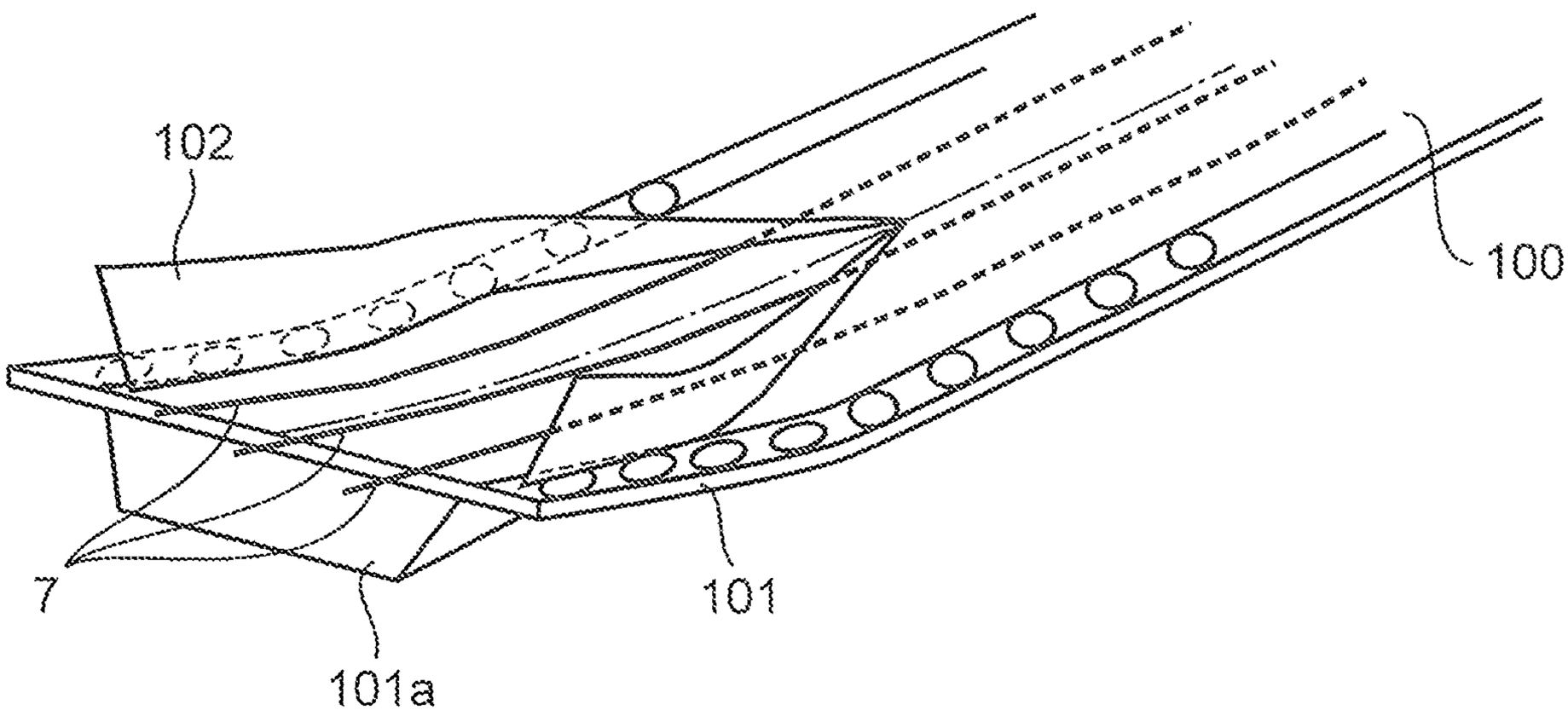


FIG. 19

FIG.17



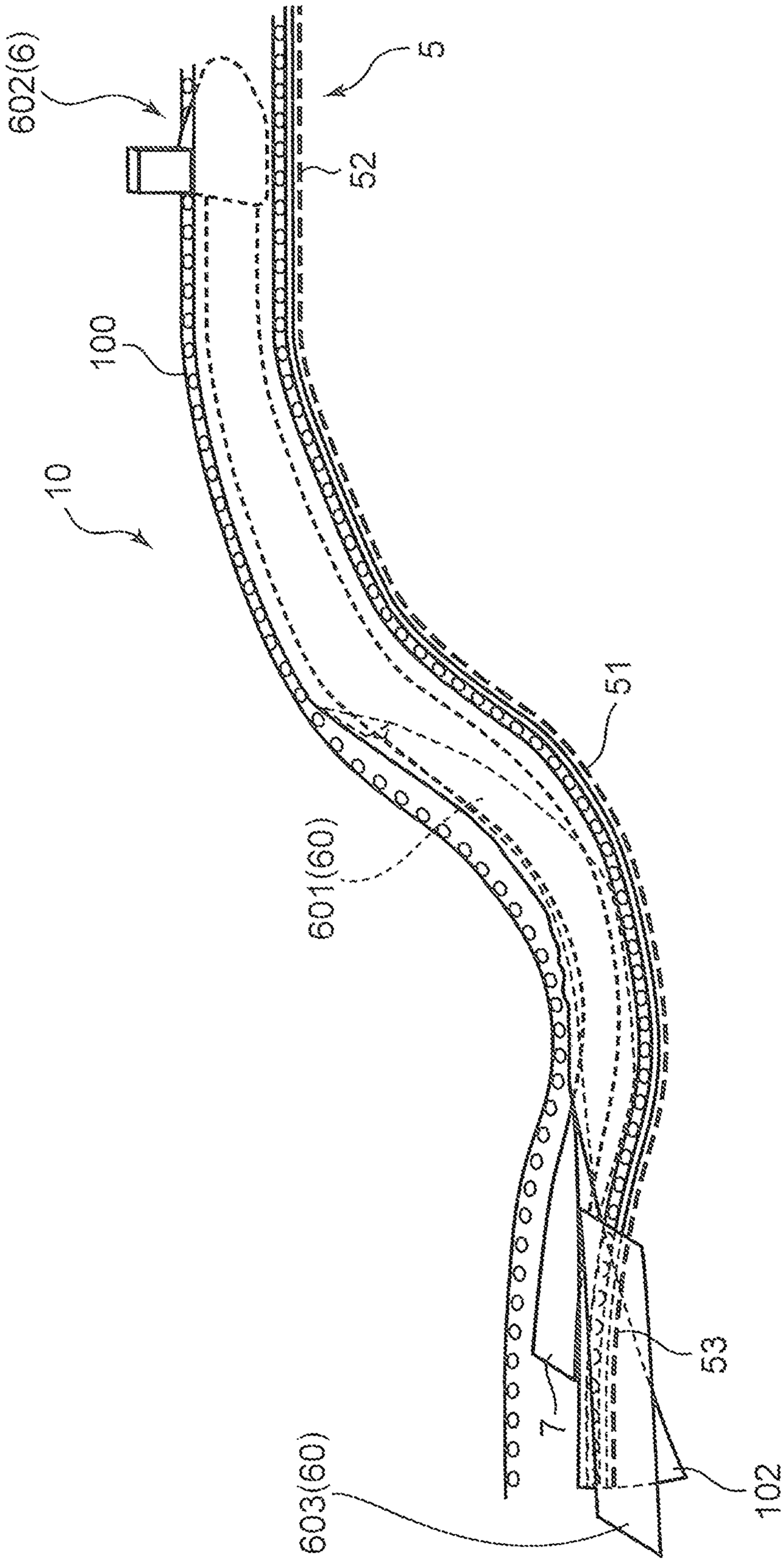
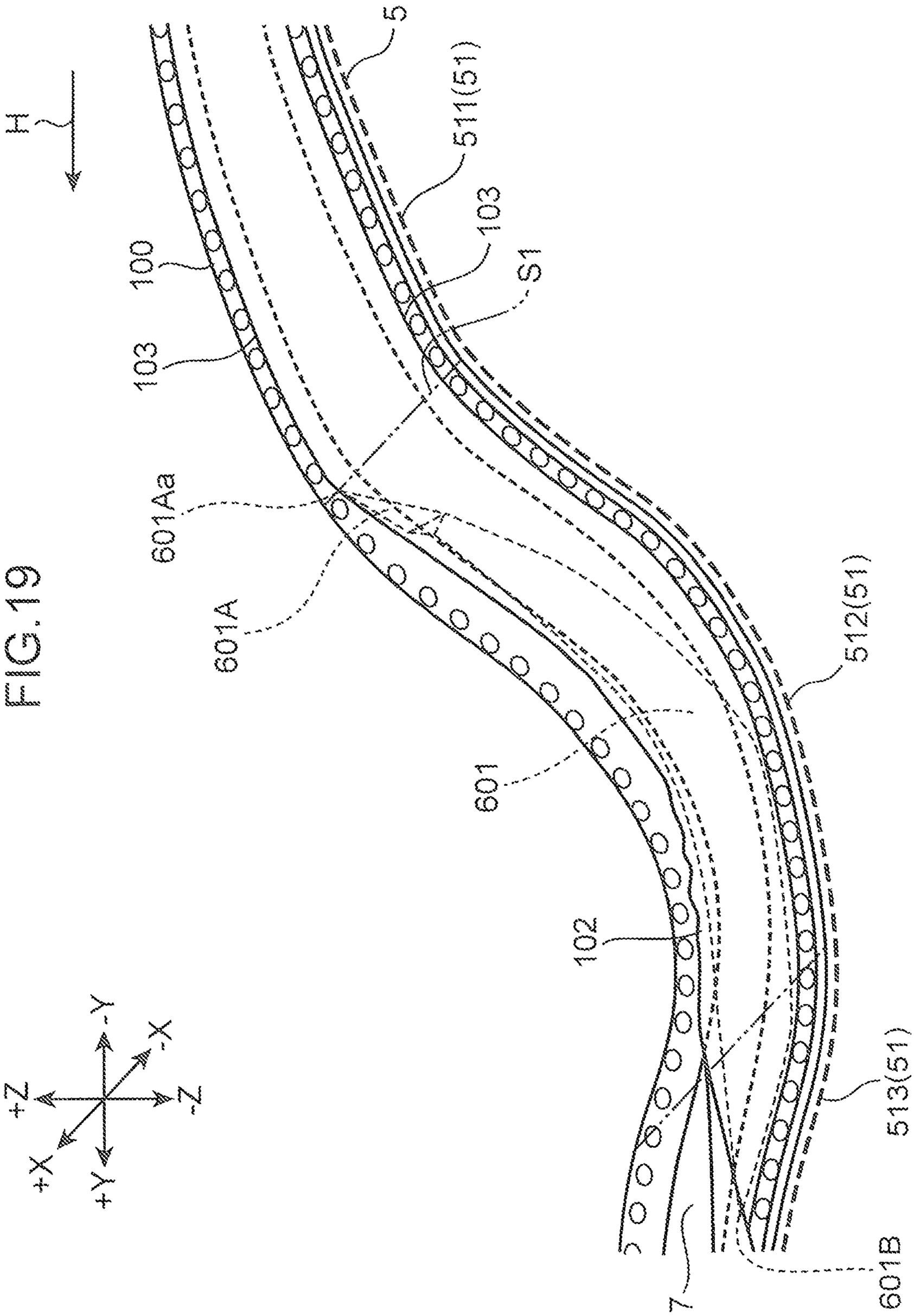


FIG. 18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601Aa
601A
601
102
7
601B
513(51)
512(51)
511(51)
5
S1
Y-
X-
Z+
Z-
X+
Y+

FIG. 19

FIG.20A

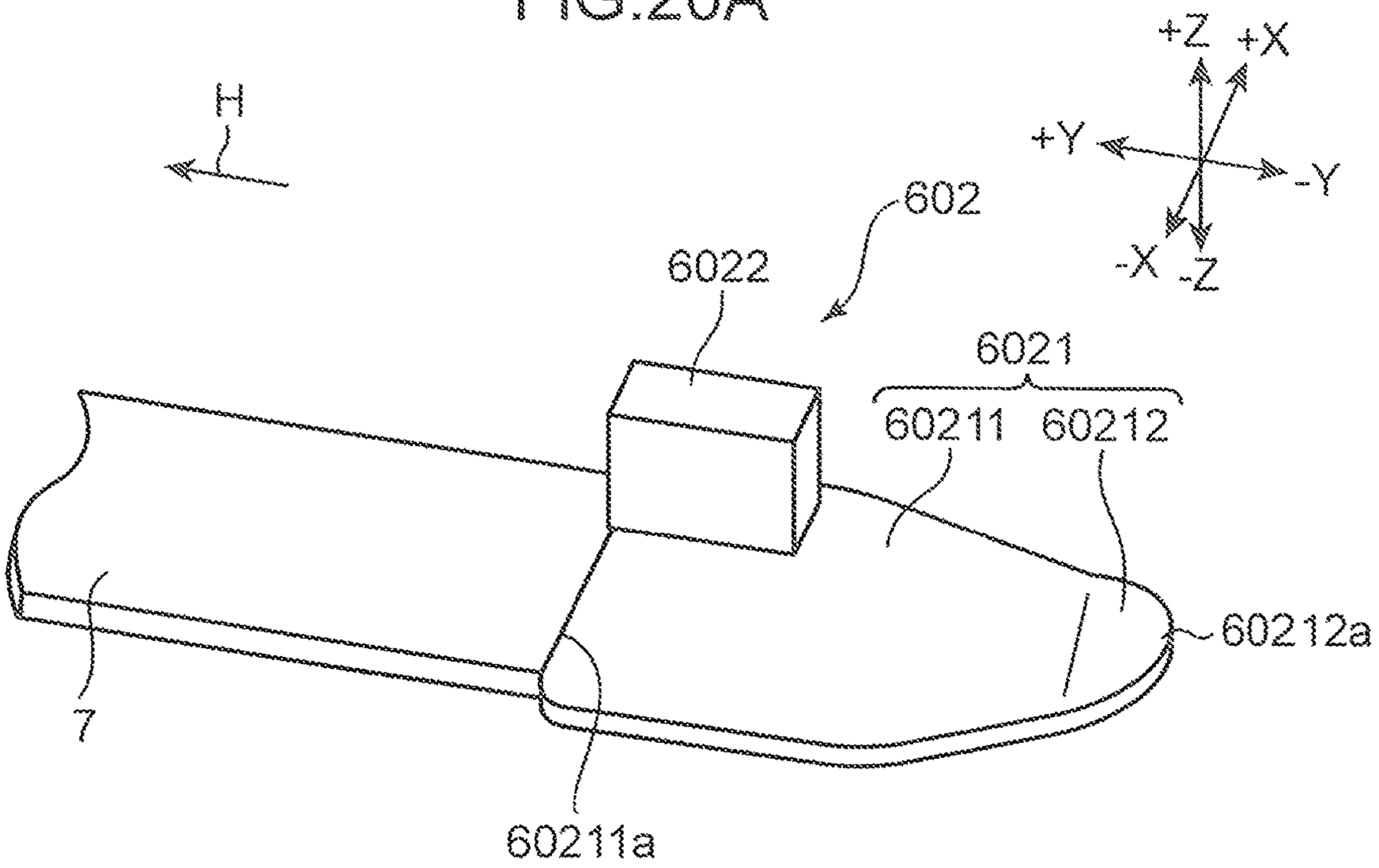
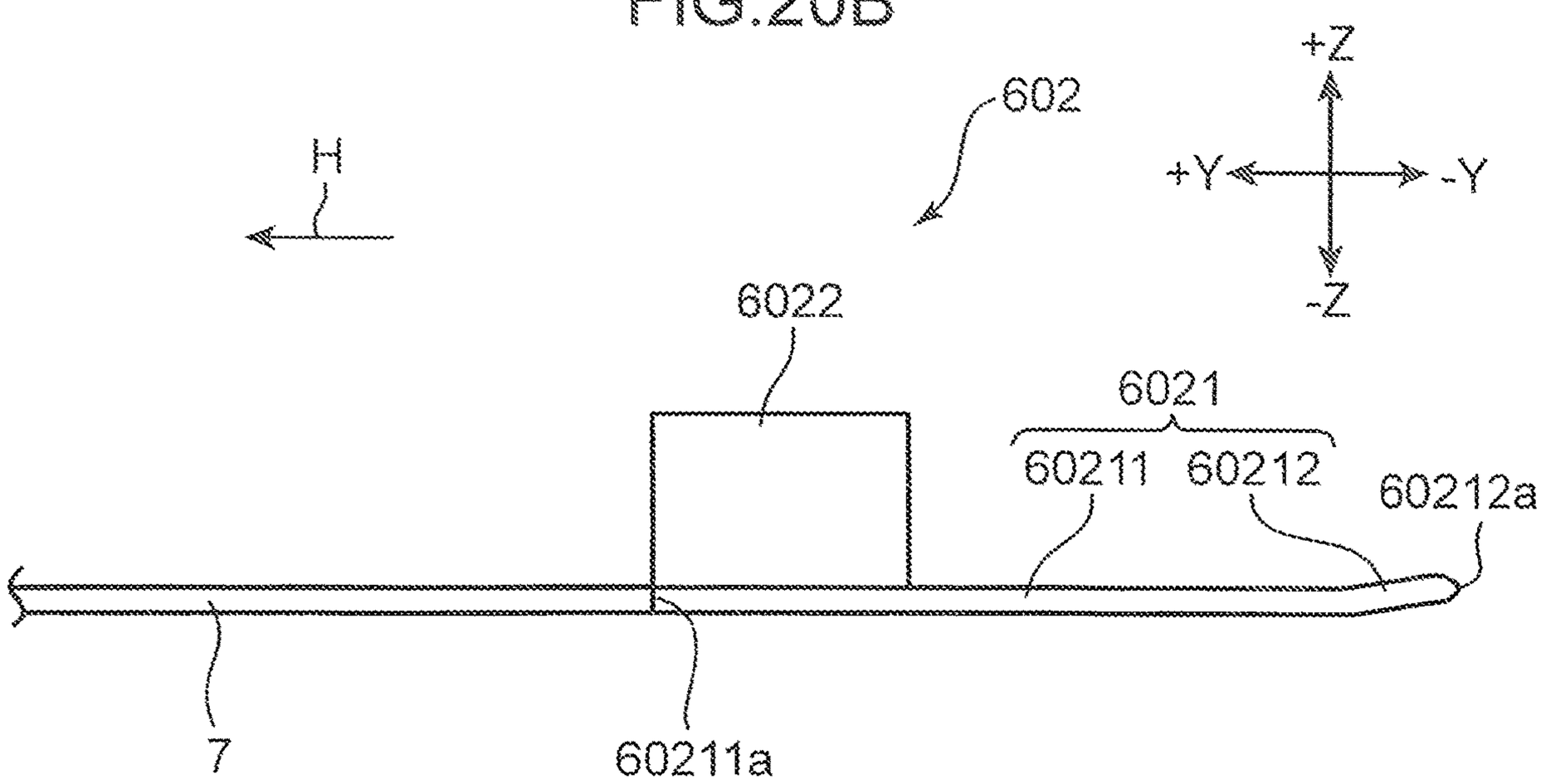


FIG.20B



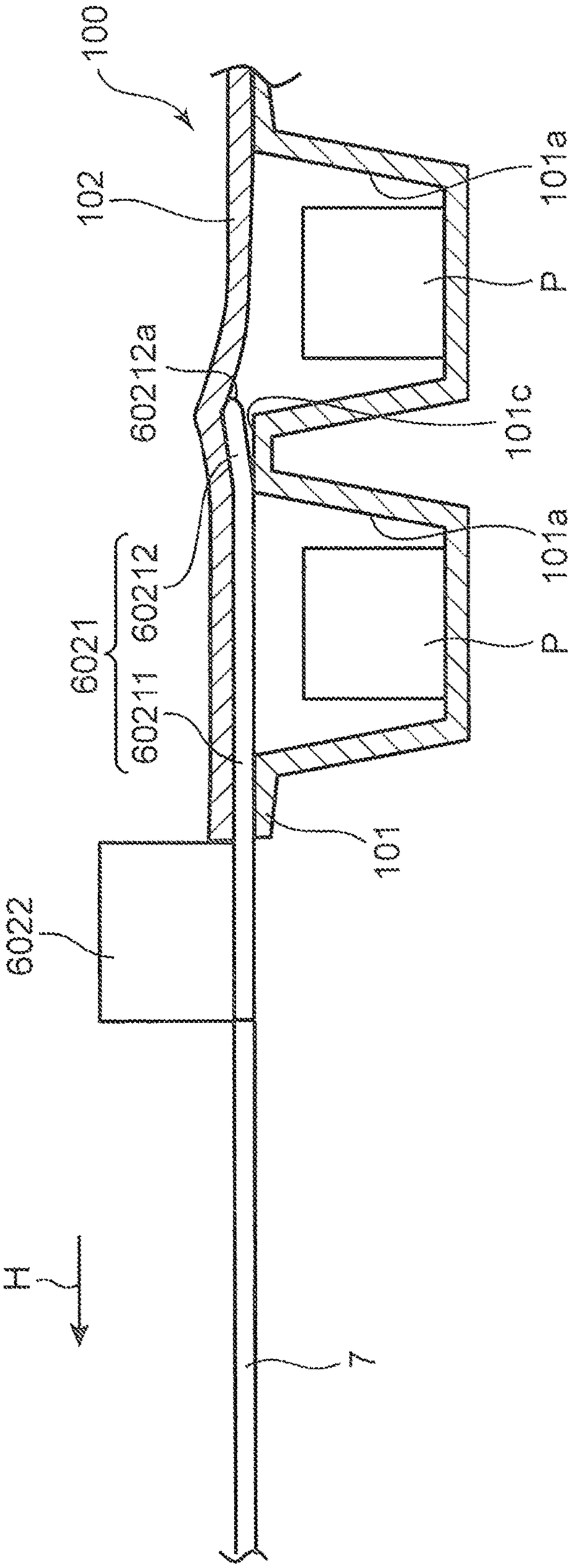


FIG.21A

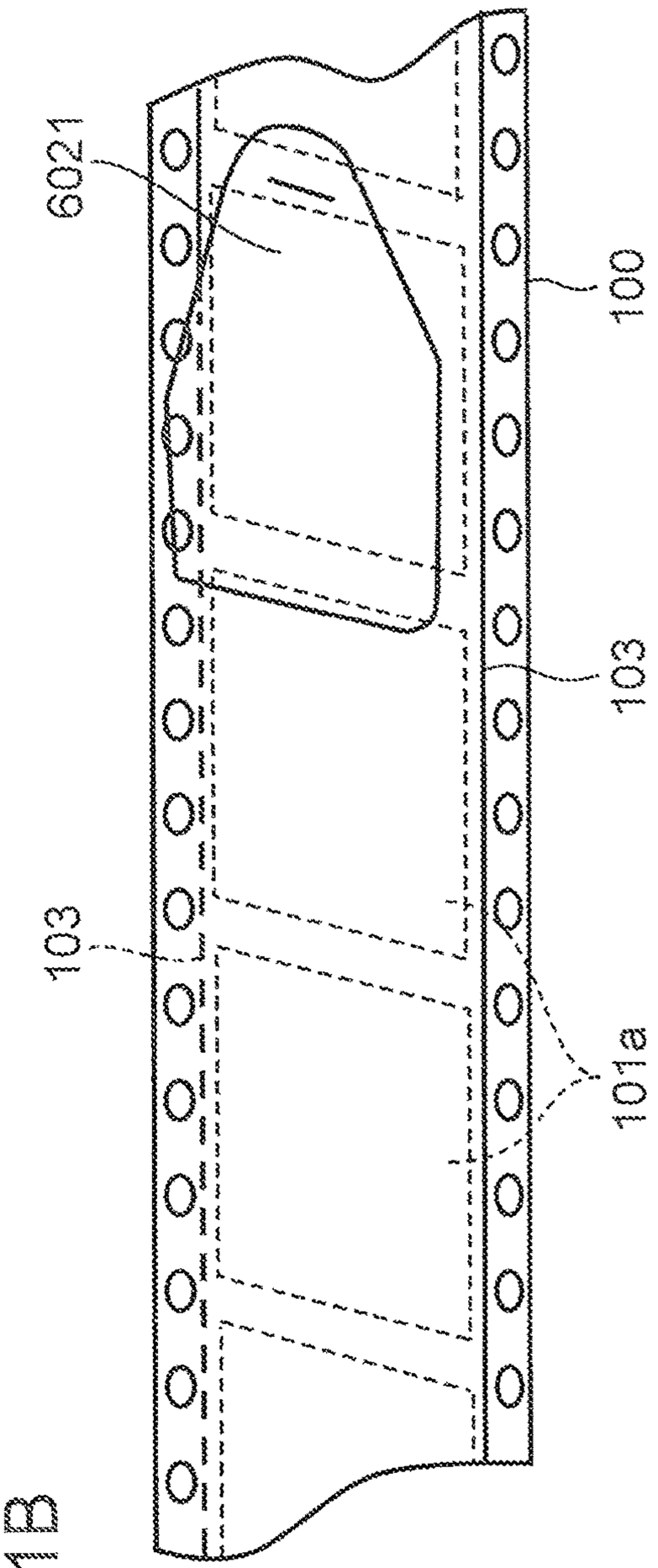


FIG.21B

FIG.22A

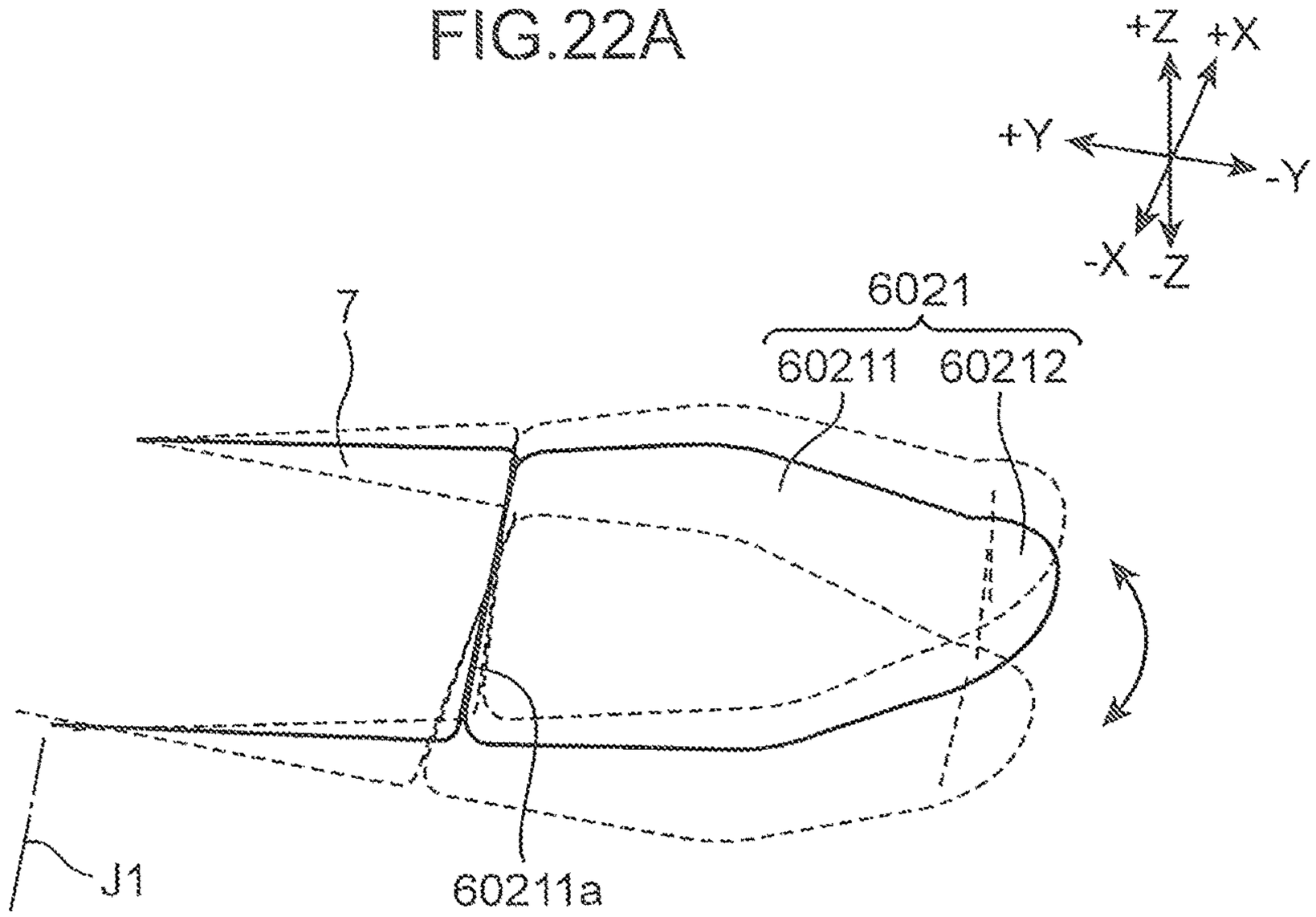


FIG.22B

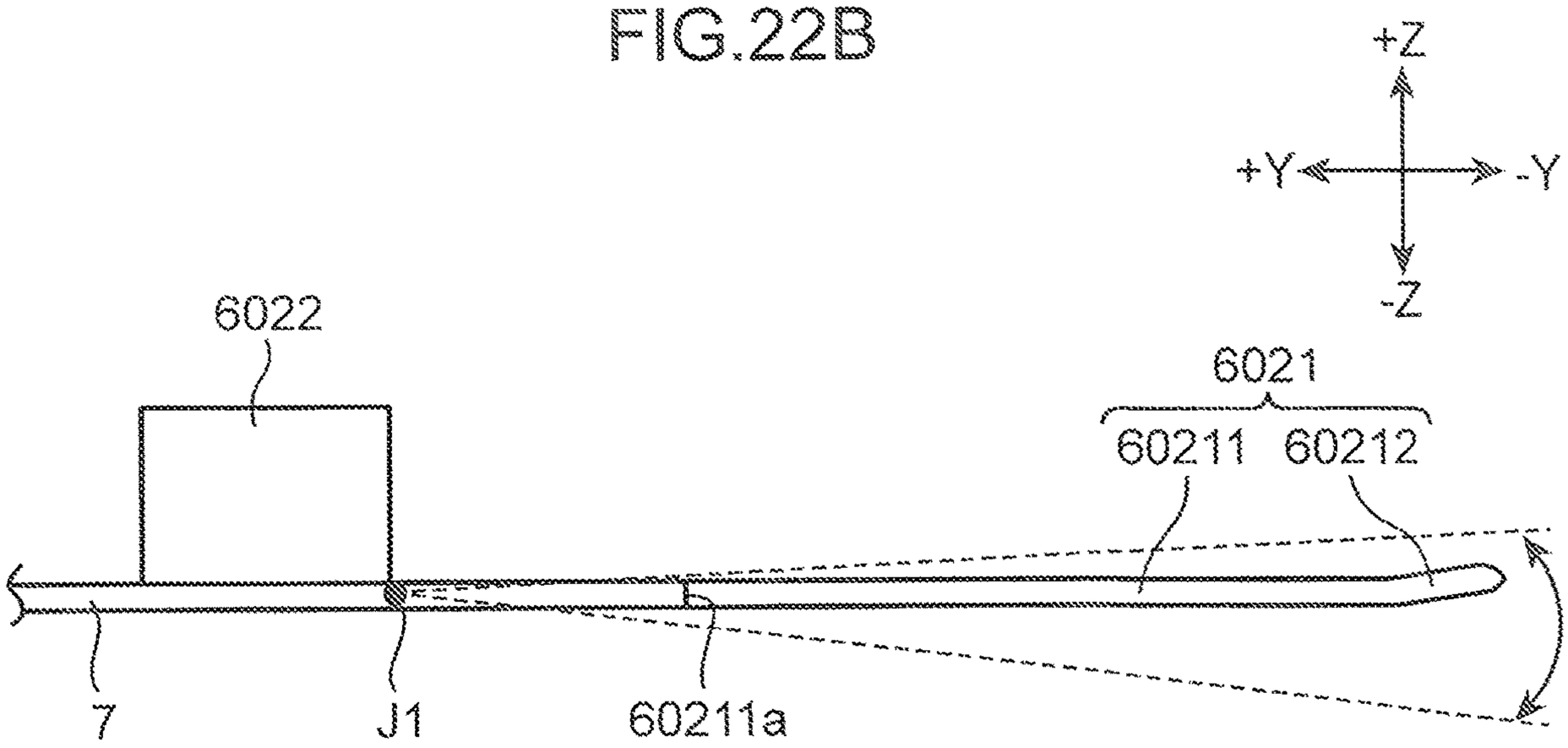


FIG.23A

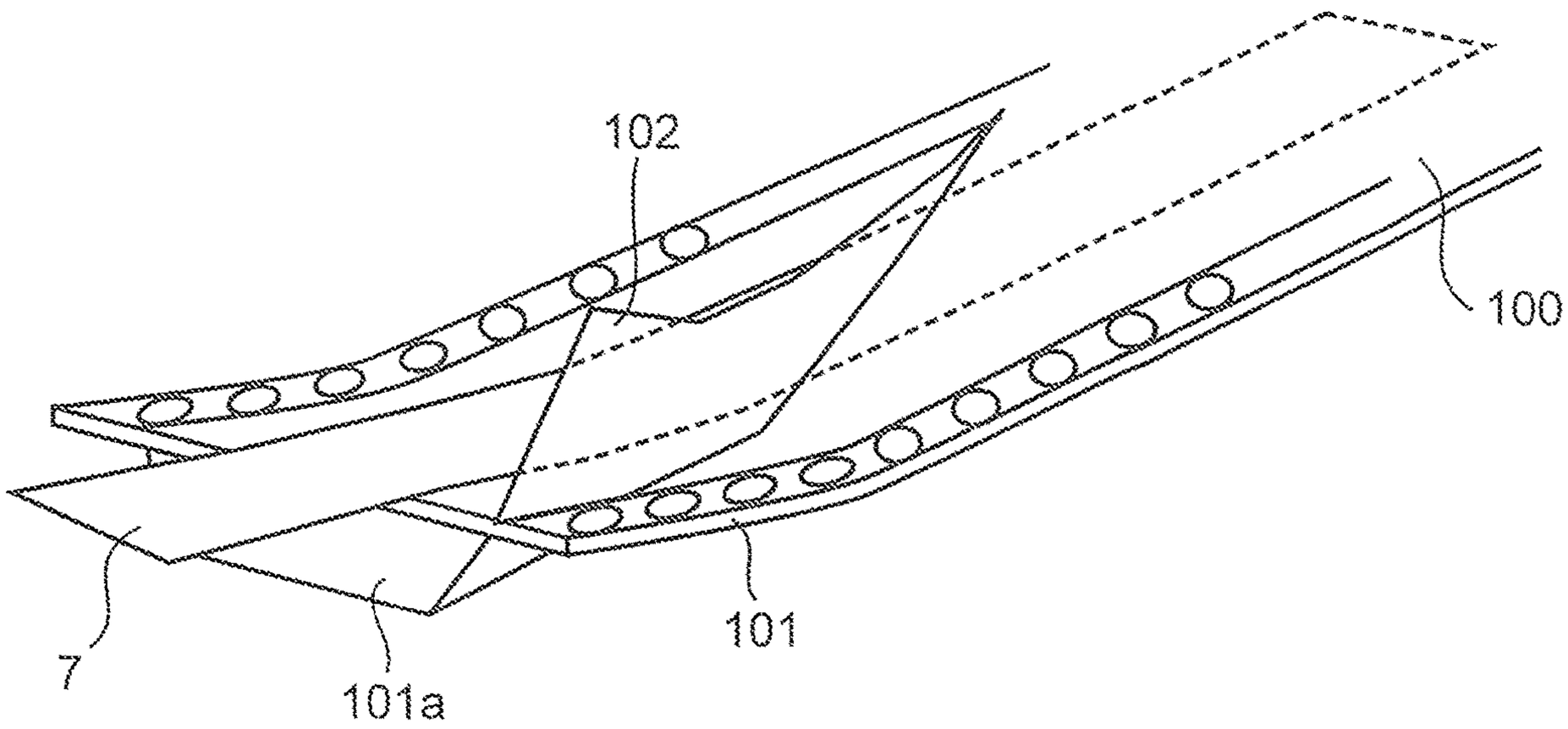
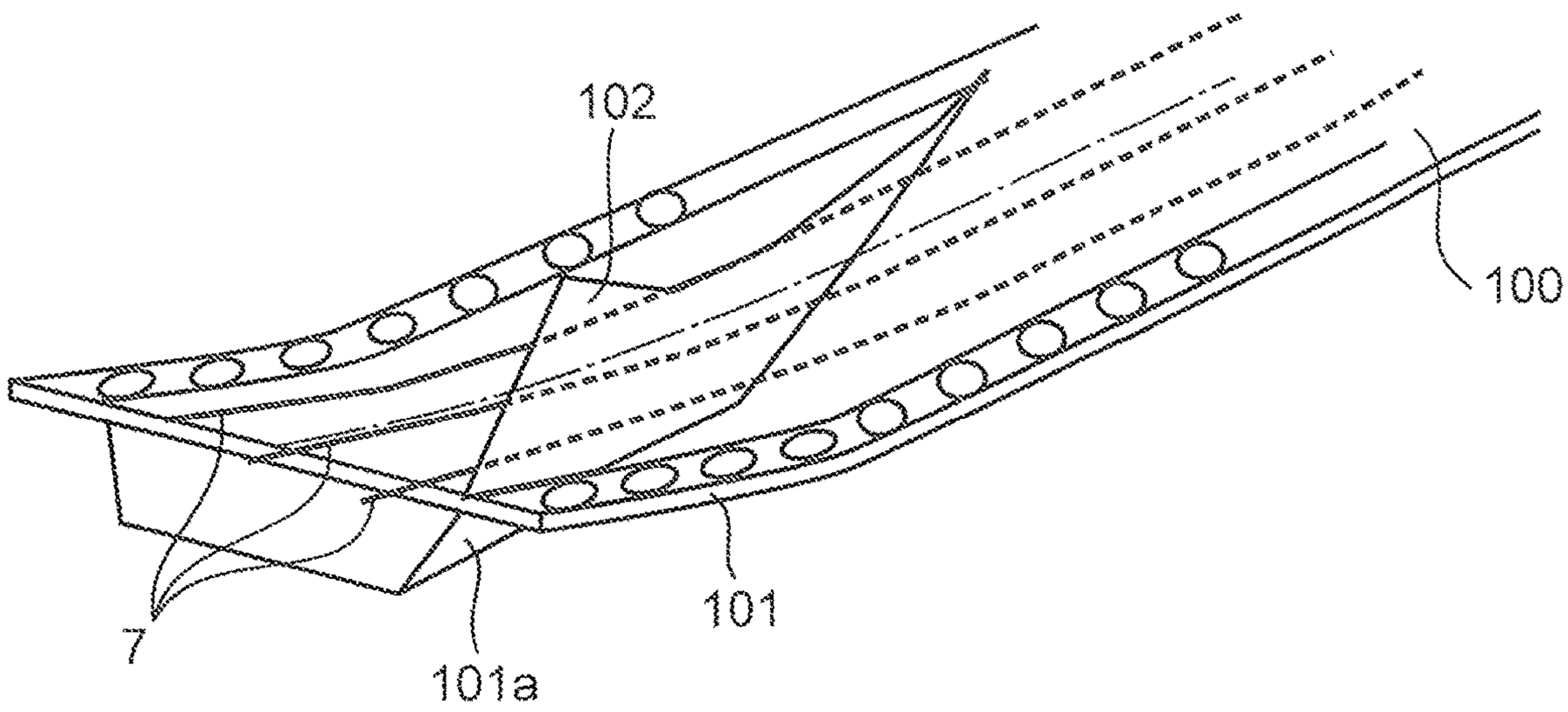


FIG.23B



COMPONENT SUPPLY DEVICE

CROSS-REFERENCE TO RELATED APPLICATION

This application is a National Stage of International Patent Application No. PCT/JP2016/073311, filed Aug. 8, 2016, the entire content of which is incorporated herein by reference.

BACKGROUND

Technical Field

The present disclosure relates to a component supply device that supplies components stored in a component storage tape to a component extracting position.

Background Art

A component mounting machine for mounting electronic components (hereinbelow, merely referred to as the "components") on a substrate such as a printed wiring board is provided with a component supply device that supplies the components to a component extracting position. A device using a component storage tape in which components are stored is known as the component supply device. The component storage tape includes a carrier tape which includes component storage parts for storing the components and a cover tape which is stuck to the carrier tape to cover the component storage parts. This kind of component supply device is disclosed, for example, in JP 2011-155181 A.

The component supply device (feeder) disclosed in JP 2011-155181 A is provided with a tape chute which serves as a travel path for a component storage tape and a guide mechanism. The guide mechanism includes a cutter which cuts a cover tape of the component storage tape traveling on the tape chute and a cover tape guide which guides the cut cover tape. Here, the tape chute is formed in a recessed shape so that the component storage tape travels downward once and then travels upward again.

In the component supply device disclosed in JP 2011-155181 A, the cover tape of the component storage tape traveling on the tape chute formed in a recessed shape is raised to the upper side and spread out in the right-left direction by the cover tape guide while being cut by the cutter. Accordingly, a component is removably exposed inside a component storage part of the component storage tape.

SUMMARY

In a component storage tape, a carrier tape may deform in a buckling manner when a cover tape is raised and spread out to expose a component. A deformation amount of the buckling deformation of the carrier tape tends to increase as the length in the width direction of the component storage tape becomes longer and a raised region of the cover tape expands. Further, the deformation amount of the buckling deformation of the carrier tape tends to increase as a travel distance of the component storage tape during the raising of the cover tape becomes shorter.

In the above conventional component supply device, the tape chute which serves as the travel path for the component storage tape is formed in a recessed shape. Thus, in view of the above tendencies relating the buckling deformation of the carrier tape, it seems that, in the above conventional component supply device, the travel distance of the component storage tape during the raising of the cover tape by the cover tape guide becomes long, which enables the buckling deformation of the carrier tape to be prevented.

However, in the above conventional component supply device, the most upstream end and the most downstream end in a tape feeding direction of the component storage tape are located at the same height position in a region part formed in a recessed shape in the tape chute. In such a configuration, when the component storage tape travels downward once and then travels upward again along the tape chute having a recessed shape, a tensile stress directing from the downstream end in the tape feeding direction toward a raising starting point (the starting point of contact between the cover tape and the cover tape guide) is generated in the cover tape raised by the cover tape guide. When the tensile stress is generated in the cover tape, the buckling deformation of the carrier tape is caused by the stress. When the carrier tape deforms in a buckling manner, the traveling performance of the component storage tape is deteriorated, which reduces the efficiency of supplying components to a component extracting position by the component supply device.

The present disclosure has been made in view of the above circumstances, and provides a component supply device that supplies components stored in a component storage tape to a component extracting position, the component supply device being capable of efficiently supplying the components.

A component supply device according to one aspect of the present disclosure supplies components to a component extracting position using a component storage tape, the component storage tape including a carrier tape including a plurality of component storage parts arrayed at predetermined intervals for storing the components and a cover tape stuck to the carrier tape to cover the component storage parts. The component supply device includes a tape feeding unit that feeds the component storage tape toward the component extracting position in a tape feeding direction along an array direction of the component storage parts, a tape travel path forming unit that forms a travel path leading to the component extracting position for the component storage tape fed by the tape feeding unit, and a component exposing unit that is disposed on the travel path and exposes the components inside the component storage parts of the component storage tape traveling on the travel path. The travel path includes a first path part including a slope part, the slope part being inclined to one direction side in a first direction perpendicular to a width direction of the travel path and the tape feeding direction from an upstream side toward a downstream side in the tape feeding direction. The component exposing unit includes a cover tape raising unit that performs a raising process for raising the cover tape of the component storage tape with respect to the carrier tape to expose the components by coming into contact with the cover tape. The cover tape raising unit is disposed on the first path part on the travel path.

The objects, features, and advantages of the present disclosure will become more apparent from the following detailed description and the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a diagram schematically illustrating the configuration of a component supply device according to a first embodiment of the present disclosure;

FIGS. **2**A and **2**B are diagrams illustrating the configuration of a component storage tape used in the component supply device;

FIG. **3** is a diagram illustrating a tape feeding unit included in the component supply device viewed in a tape feeding direction;

FIG. **4** is a diagram illustrating the configuration of a tape travel path forming unit included in the component supply device;

FIG. **5** is a diagram illustrating the configuration of a component exposing unit included in the component supply device;

FIG. **6** is a diagram illustrating the configuration of a cover tape raising unit in the component exposing unit;

FIG. **7** is a diagram for describing the shape of a first path part in a travel path formed from the tape travel path forming unit;

FIGS. **8**A, **8**B and **8**C are diagrams for describing the shapes of a first region and a second region in the first path part of the travel path;

FIG. **9** is a diagram for describing the shape of the second region in the first path part of the travel path;

FIG. **10** is a diagram illustrating a state of buckling deformation of a carrier tape during a raising process for a cover tape of the component storage tape;

FIGS. **11**A and **11**B are diagrams illustrating the configuration of a cover tape pre-process unit in the component exposing unit;

FIG. **12** is a diagram illustrating a state in which an insertion member of the cover tape pre-process unit is inserted between the cover tape and the carrier tape of the component storage tape;

FIGS. **13**A and **13**B are diagrams illustrating a state in which a cover tape cutting member of the cover tape pre-process unit cuts the cover tape of the component storage tape;

FIGS. **14**A and **14**B are diagrams illustrating a state of swings of the insertion member and the cover tape cutting member of the cover tape pre-process unit;

FIG. **15** is a diagram illustrating a cover member included in the component supply device;

FIG. **16** is a diagram illustrating a modification of the cover member;

FIG. **17** is an enlarged view of the cover member of FIG. **16**;

FIG. **18** is a diagram schematically illustrating the configuration of a component exposing unit included in a component supply device according to a second embodiment of the present disclosure;

FIG. **19** is a diagram illustrating the configuration of a cover tape raising unit in the component exposing unit according to the second embodiment;

FIGS. **20**A and **20**B are diagrams illustrating the configuration of a cover tape pre-process unit in the component exposing unit according to the second embodiment;

FIGS. **21**A and **21**B are diagrams illustrating a state in which an insertion member of the cover tape pre-process unit is inserted between a cover tape and a carrier tape of a component storage tape;

FIGS. **22**A and **22**B are diagrams illustrating a state of a swing of the insertion member of the cover tape pre-process unit; and

FIGS. **23**A and **23**B are diagrams illustrating a cover member included in the component supply device according to the second embodiment.

DETAILED DESCRIPTION

Hereinbelow, a component supply device according to embodiments of the present disclosure will be described

with reference to the drawings. In the following description, the directional relationship will be described using XYZ rectangular coordinate axes. A right-left direction is defined as an X-axis direction, a front-rear direction perpendicular to the X-axis direction is defined as a Y-axis direction, and an upper-lower direction perpendicular to both the X-axis direction and the Y-axis direction is defined as a Z-axis direction. Further, a left direction which is one direction in the X-axis direction is referred to as a "+X direction", and a right direction which is the other direction opposite to the one direction in the X-axis direction is referred to as a "−X direction". Further, a front direction which is one direction in the Y-axis direction is referred to as a "+Y direction", and a rear direction which is the other direction opposite to the one direction in the Y-axis direction is referred to as a "−Y direction". Further, a lower direction which is one direction in the Z-axis direction is referred to as a "−Z direction", and an upper direction which is the other direction opposite to the one direction in the Z-axis direction is referred to as a "+Z direction".

First Embodiment

FIG. **1** is a diagram schematically illustrating the configuration of a component supply device **1** according to a first embodiment of the present disclosure. The component supply device **1** is attached to a component mounting machine for mounting components on a substrate such as a printed wiring board and used for supplying components stored in a component storage tape to a component extracting position **21**. The component supplied to the component extracting position **21** by the component supply device **1** is extracted from the component storage tape by a suction nozzle included in the component mounting machine and then mounted on the substrate. The suction nozzle is capable of sucking and holding a component (extracting the component) by the supply of a negative pressure to the suction nozzle. The sucking and holding of the component is released by the supply of a positive pressure to the suction nozzle. A mechanism for removing a component from the component storage tape may be a head unit which is provided with a plurality of mounting heads each of which includes a suction nozzle attached to the tip thereof. Prior to describing the configuration of the component supply device **1**, the component storage tape will be described with reference to FIGS. **2**A and **2**B. FIGS. **2**A and **2**B are diagrams illustrating the configuration of a component storage tape **100** which is used in the component supply device **1**.

The component storage tape **100** includes a carrier tape **101** and a cover tape **102**. The carrier tape **101** includes a plurality of component storage parts **101***a* which are arrayed at predetermined intervals for storing components P. Further, the carrier tape **101** includes engagement holes **101***b* which are arrayed at predetermined intervals on both ends in the width direction of the carrier tape **101**. The engagement holes **101***b* are engaged with teeth of a first sprocket **311**, a second sprocket **321**, and a third sprocket **331** in a tape feeding unit **3** (described below) to feed the component storage tape **100** by the tape feeding unit **3**. Note that "the engagement holes **101***b* of the component storage tape **100** are engaged with the teeth of the first sprocket **311**, the second sprocket **321**, and the third sprocket **331**" indicates a state in which the teeth are fit in the engagement holes **101***b* to enable feeding of the component storage tape **100** in conjunction with the rotations of the first sprocket **311**, the second sprocket **321**, and the third sprocket **331**.

The cover tape **102** is stuck to the carrier tape **101** to cover the component storage parts **101***a*. Both ends in the width direction of the cover tape **102** are melted to stick the cover tape **102** to the carrier tape **101**. Thus, in the component storage tape **100**, fused parts **103** formed by the melting of the cover tape **102** are linearly formed on both ends in the width direction of the upper face of the carrier tape **101** along the inner side of edges in the width direction of the cover tape **102**. In the width direction of the carrier tape **101**, the fused parts **103** are disposed on the inner side with respect to the engagement holes **101***b*.

In the component storage tape **100** having the configuration as described above, a length K**1** between the fused parts **103**, which are formed on both the ends in the width direction of the carrier tape **101** along the inner side of the edges in the width direction of the cover tape **102**, is substantially equal to the length in the width direction of the cover tape **102**. Further, a length K**2** in the width direction of the component storage tape **100** is equal to the length in the width direction of the carrier tape **101**.

As illustrated in FIG. **1**, the component supply device **1** is provided with a device body **2**, the tape feeding unit **3**, a tape travel path forming unit **4**, a component exposing unit **6**, and a cover member **7**. The device body **2** is a housing which accommodates each unit of the component supply device **1**. An operation panel **22** is attached to the device body **2**. The operation panel **22** is a part to which an instruction for operating the component supply device **1** is input by an operator.

FIG. **3** is a diagram schematically illustrating the configuration of the tape feeding unit **3** included in the component supply device **1** viewed in a tape feeding direction H. FIG. **4** is a diagram illustrating the configuration of the tape travel path forming unit **4** included in the component supply device **1**. FIG. **5** is a diagram illustrating the configuration of the component exposing unit **6** included in the component supply device **1**.

The tape feeding unit **3** feeds the component storage tape **100** toward the component extracting position **21** in the predetermined tape feeding direction H along the array direction of the component storage parts **101***a*. The tape feeding direction H when the tape feeding unit **3** feeds the component storage tape **100** toward the component extracting position **21** corresponds to the +Y direction. The tape feeding unit **3** intermittently feeds the component storage tape **100** in the tape feeding direction H so that the component storage parts **101***a* arrive at the component extracting position **21** one by one at predetermined time intervals. The tape feeding unit **3** is capable of executing a loading operation for feeding the component storage tape **100** toward the component extracting position **21** in the tape feeding direction H and an unloading operation for feeding the component storage tape **100** in the −Y direction which is opposite to the tape feeding direction H.

The tape travel path forming unit **4** forms a travel path **5** leading to the component extracting position **21** for the component storage tape **100** which is fed by the tape feeding unit **3**. As illustrated in FIGS. **1** and **4**, the tape travel path forming unit **4** includes a pair of guide walls **41** and a plurality guide rollers including first to sixth guide rollers **42**, **43**, **44**, **45**, **46**, **47**.

The pair of guide walls **41** is a pair of wall parts which is opposed to each other with a predetermined interval therebetween in the X-axis direction and extends in the Y-axis direction inside the device body **2**. Both ends in the X-axis direction of a face on the −Z direction side (the lower face) of the component storage tape **100**, which is fed by the tape feeding unit **3**, are guided by end faces **411** (hereinbelow, referred to as the "guide faces **411**") on the +Z direction side of the pair of guide walls **41**. That is, the travel path **5** is formed along the guide faces **411** of the pair of guide walls **41**. The pair of guide walls **41** is cut away in region parts in which a pair of the second sprockets **321** of a second feeding unit **32** and a pair of the third sprockets **331** of a third feeding unit **33** (described below) are disposed in the tape feeding unit **3**.

A distance K**3** between opposed inner faces of the pair of guide walls **41** is set to be substantially equal to the length K**1** between the fused parts **103** of the component storage tape **100**. Further, a distance K**4** between outer faces of the pair of guide walls **41** is set to be substantially equal to the length K**2** in the width direction of the component storage tape **100**. The distance K**4** corresponds to the length in the width direction (X-axis direction) of the travel path **5**.

As illustrated in FIG. **4**, the travel path **5**, which is formed along the guide faces **411** of the pair of guide walls **41**, includes a first path part **51**, a second path part **52**, and a third path part **53**. The first path part **51** in the travel path **5** is a path including a slope part which is inclined to one direction side (the −Z direction side, the lower direction side) in the Z-axis direction (the first direction, the upper-lower direction) which is perpendicular to the width direction of the travel path **5** (the X-axis direction) and the tape feeding direction H from the upstream side toward the downstream side in the tape feeding direction H. The first path part **51** includes a first region **511** which is located on the most upstream side in the tape feeding direction H, a second region **512** which is continuous with the downstream side in the tape feeding direction H of the first region **511**, and a third region **513** which is continuous with the downstream side in the tape feeding direction H of the second region **512**. The details of the shape of the first path part **51** will be described below.

The second path part **52** in the travel path **5** is a path which is continuous with the upstream side in the tape feeding direction H of the first path part **51**. In the present embodiment, the second path part **52** horizontally extends from the upstream side toward the downstream side in the tape feeding direction H.

The third path part **53** in the travel path **5** is a path which is continuous with the downstream side in the tape feeding direction H of the first path part **51** and leads to the component extracting position **21**. In the present embodiment, the third path part **53** includes a horizontal region **531** and an inclined region **532**. The horizontal region **531** is a region part which is continuous with the third region **513** of the first path part **51** and horizontally extends in the tape feeding direction H. The downstream end in the tape feeding direction H of the horizontal region **531** in the third path part **53** corresponds to the component extracting position **21** in the tape feeding direction H. In this manner, the configuration in which the component extracting position **21** is located in the horizontal region **531**, which is a horizontal region part in the third path part **53**, improves the accuracy of extracting the component P from the component storage tape **100** at the component extracting position **21**. The inclined region **532** is a region part which is continuous with the downstream side in the tape feeding direction H of the horizontal region **531** and inclined downward.

Each of the first to sixth guide rollers **42**, **43**, **44**, **45**, **46**, **47** of the tape travel path forming unit **4** is a pair of rollers which is separated from each other in the X-axis direction and rotatable around an axis extending in the X-axis direction. The first to sixth guide rollers **42**, **43**, **44**, **45**, **46**, **47**

form the first path part **51** in the travel path **5** together with the guide faces **411** of the pair of guide walls **41**.

The first guide roller **42** is disposed on the upstream end in the tape feeding direction H of the first region **511** in the first path part **51**. The first guide roller **42** slightly projects to the +Z direction side (the upper direction side) with respect to the guide faces **411** of the pair of guide walls **41**. The first guide roller **42** guides both the ends in the X-axis direction of the face on the −Z direction side (the lower face) of the component storage tape **100** which is fed by the tape feeding unit **3**.

The second guide roller **43** is disposed on the downstream side in the tape feeding direction H with respect to the first guide roller **42** in the first region **511** in the first path part **51**. The second guide roller **43** slightly projects to the +Z direction side (the upper direction side) with respect to the guide faces **411** of the pair of guide walls **41**. The second guide roller **43** guides both the ends in the X-axis direction of the face on the −Z direction side (the lower face) of the component storage tape **100** which is fed by the tape feeding unit **3**.

The third guide roller **44** is disposed facing the second guide roller **43** in the first region **511** in the first path part **51**. The third guide roller **44** guides both ends in the X-axis direction of a face on the +Z direction side (the upper face) of the component storage tape **100** which is fed by the tape feeding unit **3**.

The fourth guide roller **45** is disposed facing the guide faces **411** of the pair of guide walls **41** in the second region **512** in the first path part **51**. The fourth guide roller **45** guides both the ends in the X-axis direction of the face on the +Z direction side (the upper face) of the component storage tape **100** which is fed by the tape feeding unit **3**.

The fifth guide roller **46** is disposed facing the guide faces **411** of the pair of guide walls **41** on the downstream side in the tape feeding direction H with respect to the fourth guide roller **45** in the second region **512** in the first path part **51**. The fifth guide roller **46** guides both the ends in the X-axis direction of the face on the +Z direction side (the upper face) of the component storage tape **100** which is fed by the tape feeding unit **3**.

The sixth guide roller **47** is disposed facing the guide faces **411** of the pair of guide walls **41** in the third region **513** in the first path part **51**. The sixth guide roller **47** guides both the ends in the X-axis direction of the face on the +Z direction side (the upper face) of the component storage tape **100** which is fed by the tape feeding unit **3**.

As described above, each of the first to sixth guide rollers **42**, **43**, **44**, **45**, **46**, **47** is rotatable around the axis extending in the X-axis direction. Thus, it is possible to reduce a frictional force which is generated when the first to sixth guide rollers **42**, **43**, **44**, **45**, **46**, **47** guide the component storage tape **100** fed by the tape feeding unit **3**. Thus, it is possible to reduce a traveling resistance when the component storage tape **100** travels on the first path part **51** which is formed from the first to sixth guide rollers **42**, **43**, **44**, **45**, **46**, **47** and the guide faces **411** of the pair of guide walls **41**.

Although the tape travel path forming unit **4** which includes the first to sixth guide rollers **42**, **43**, **44**, **45**, **46**, **47** and the pair of guide walls **41** has been described above, the tape travel path forming unit **4** is not limited to such a configuration. For example, the tape travel path forming unit **4** may have a configuration in which a plurality of pairs of rollers opposed in the Z-axis direction are arrayed.

The configuration of the tape feeding unit **3** will be specifically described with reference to FIGS. **1** to **3**. The tape feeding unit **3** includes a first feeding unit **31**, the second feeding unit **32**, and the third feeding unit **33**.

The first feeding unit **31** is disposed on the upstream end in the tape feeding direction H of the second path part **52** in the travel path **5**. The first feeding unit **31** feeds the component storage tape **100** with a tip of the component storage tape **100** being a free end to cause the component storage tape **100** to travel on the second path part **52** and the first path part **51**. The first feeding unit **31** includes a pair of the first sprockets **311**, a pair of first worm wheels **312**, a pair of first worms **313**, a first servomotor **314**, a first belt **315**, and a first tension roller **316**.

The pair of first sprockets **311** is a pair of disc-like sprockets which is supported on the device body **2** rotatably around an axis extending in the X-axis direction. The pair of first sprockets **311** is provided with a plurality of teeth **311***a* which are arrayed at predetermined intervals in the circumferential direction. Each of the teeth **311***a* of the pair of first sprockets **311** is engageable with the engagement holes **101***b* which are formed on both the ends in the width direction of the carrier tape **101** of the component storage tape **100**. Further, a one-way clutch which transmits torque only in one direction is incorporated in the pair of first sprockets **311**.

Each of the first worm wheels **312** is a worm gear which is disposed coaxially with each of the pair of first sprockets **311**. Each of the pair of first worms **313** is a screw-like gear which is meshed with each of the pair of first worm wheels **312**.

The first servomotor **314** is a driving source which produces a driving force for rotating the pair of first sprockets **311**. The first servomotor **314** includes a motor output shaft **314***a* for outputting the driving force. The first belt **315** is an endless belt and stretched between the motor output shaft **314***a* and the pair of first worms **313**. The first belt **315** circularly travels by the rotation of the first servomotor **314**. The first tension roller **316** abuts on the outer peripheral face of the first belt **315** and applies a tension to the first belt **315**.

In the first feeding unit **31** configured as described above, a rotary driving force of the first servomotor **314** is transmitted to the pair of first worm wheels **312** through the first belt **315** and the pair of first worms **313**. Accordingly, the pair of first worm wheels **312** rotates. When the pair of first worm wheels **312** rotates, the pair of first sprockets **311** rotates in conjunction with the rotation of the pair of first worm wheels **312**. When the pair of first sprockets **311** rotates, the component storage tape **100** which includes the carrier tape **101** having the engagement holes **101***b* which are engaged with the teeth **311***a* of the first sprockets **311** is fed.

The second feeding unit **32** is disposed on the downstream end in the tape feeding direction H of the first path part **51** in the travel path **5**, in other words, on the upstream end in the tape feeding direction H of the third path part **53**. The second feeding unit **32** receives the component storage tape **100** which is fed by the first feeding unit **31** and travels on the first path part **51** and feeds the component storage tape **100** toward the component extracting position **21**. Accordingly, the second feeding unit **32** causes the component storage tape **100** to travel on the third path part **53**.

In a manner similar to the first feeding unit **31**, the second feeding unit **32** includes the pair of second sprockets **321**, a pair of second worm wheels **322**, a pair of second worms **323**, a second servomotor **324**, a second belt **325**, and a second tension roller **326**.

The pair of second sprockets **321** is a pair of disc-like sprockets which is supported on the device body **2** rotatably around an axis extending in the X-axis direction. The pair of

second sprockets **321** is provided with a plurality of teeth **321***a* which are arrayed at predetermined intervals in the circumferential direction. In the pair of second sprockets **321**, the teeth **321***a* located on the other direction side (the +Z direction side, the upper side) in the Z-axis direction (the first direction, the upper-lower direction) are exposed from the guide faces **411** of the pair of guide walls **41**. Each of the teeth **321***a* of the pair of second sprockets **321** is engageable with the engagement holes **101***b* which are formed on both the ends in the width direction of the carrier tape **101** of the component storage tape **100**.

Each of the pair of second worm wheels **322** is a worm gear which is disposed coaxially with each of the pair of second sprockets **321**. Each of the pair of second worms **323** is a screw-like gear which is meshed with each of the pair of second worm wheels **322**.

The second servomotor **324** is a driving source which produces a driving force for rotating the pair of second sprockets **321**. The second servomotor **324** includes a motor output shaft **324***a* for outputting the driving force. The second belt **325** is an endless belt and stretched between the motor output shaft **324***a* and the pair of second worms **323**. The second belt **325** circularly travels by the rotation of the second servomotor **324**. The second tension roller **326** abuts on the outer peripheral face of the second belt **325** and applies a tension to the second belt **325**.

In the second feeding unit **32** configured as described above, a rotary driving force of the second servomotor **324** is transmitted to the pair of second worm wheels **322** through the second belt **325** and the pair of second worms **323**. Accordingly, the pair of second worm wheels **322** rotates. When the pair of second worm wheels **322** rotates, the pair of second sprockets **321** rotates in conjunction with the rotation of the pair of second worm wheels **322**. When the pair of second sprockets **321** rotates, the component storage tape **100** which includes the carrier tape **101** having the engagement holes **101***b* which are engaged with the teeth **321***a* of the second sprockets **321** is fed.

When the tip of the component storage tape **100** fed by the first feeding unit **31** arrives at the pair of second sprockets **321**, and the engagement holes **101***b* of the carrier tape **101** on the tip of the component storage tape **100** are engaged with the teeth **321***a* of the pair of second sprockets **321**, the first servomotor **314** stops. When the first servomotor **314** stops in this manner, a rotation shaft of the first sprockets **311** stops. However, the first sprockets **311** can rotate in conjunction with the movement of the component storage tape **100**, which is fed by the rotation of the pair of second sprockets **321**, by the one-way clutch interposed between the rotation shaft and the first sprockets **311** without the rotation of the rotation shaft.

The third feeding unit **33** is disposed on the downstream end in the tape feeding direction H of the horizontal region **531** in the third path part **53** of the travel path **5**. That is, the third feeding unit **33** is disposed at the position corresponding to the component extracting position **21** in the tape feeding direction H. The third feeding unit **33** receives the component storage tape **100** which is fed by the second feeding unit **32** and travels on the third path part **53** and feeds the component storage tape **100** so that the component storage tape **100** passes through the component extracting position **21**. The configuration in which the third feeding unit **33** is disposed at the position corresponding to the component extracting position **21** in the tape feeding direction H and receives the component storage tape **100** makes it possible to feed the component storage tape **100** positioned with respect to the component extracting position **21** with high accuracy.

The third feeding unit **33** includes the pair of third sprockets **331** and a pair of third worm wheels **332**. In the above description, "the third feeding unit **33** is disposed at the position corresponding to the component extracting position **21**" indicates that the third feeding unit **33** is disposed in such a manner that the component extracting position **21** is located within the range of the pair of third sprockets **331** in the tape feeding direction H when viewed in the width direction of the travel path **5** (the X-axis direction). When viewed in the width direction of the travel path **5** (the X-axis direction), the component extracting position **21** is desirably located immediately above the top (the uppermost end) of the pair of third sprockets **331**. When the component extracting position **21** is located at a position shifted in the Y-axis direction from the top of the pair of third sprockets **331**, it is preferred that the position be shifted to the upstream side in the tape feeding direction H rather than to the downstream side. This is because a region part passing through the component extracting position **21** in the component storage tape **100** fed by the pair of third sprockets **331** of the third feeding unit **33** is brought into a pulled state, and deformation in the region part is thus small and the component storage tape **100** is positioned with respect to the component extracting position **21** with high accuracy.

The pair of third sprockets **331** is a pair of disc-like sprockets which is supported on the device body **2** rotatably around an axis extending in the X-axis direction. The pair of third sprockets **331** is provided with a plurality of teeth **331***a* which are arrayed at predetermined intervals in the circumferential direction. In the pair of third sprockets **331**, the teeth **331***a* located on the other direction side (the +Z direction side, the upper side) in the Z-axis direction (the first direction, the upper-lower direction) are exposed from the guide faces **411** of the pair of guide walls **41**. Each of the teeth **331***a* of the pair of third sprockets **331** is engageable with the engagement holes **101***b* which are formed on both the ends in the width direction of the carrier tape **101** of the component storage tape **100**.

Each of the pair of third worm wheels **332** is a worm gear which is disposed coaxially with each of the pair of third sprockets **331**. Each of the pair of third worm wheels **332** is meshed with each of the pair of second worm **323**.

In the third feeding unit **33** configured as described above, in a manner similar to the second feeding unit **32**, a rotary driving force of the second servomotor **324** is transmitted to the pair of third worm wheels **332** through the second belt **325** and the pair of second worms **323**. Accordingly, the pair of third worm wheels **332** rotates. When the pair of third worm wheels **332** rotates, the pair of third sprockets **331** rotates in conjunction with the rotation of the pair of third worm wheels **332**. When the pair of third sprockets **331** rotates, the component storage tape **100** which includes the carrier tape **101** having the engagement holes **101***b* which are engaged with the teeth **331***a* of the third sprockets **331** is fed.

Next, the configuration of the component exposing unit **6** included in the component supply device **1** will be described with reference to FIG. **5**. The component exposing unit **6** is disposed on the travel path **5** formed from the tape travel path forming unit **4**. The component exposing unit **6** exposes the components P inside the component storage parts **101***a* of the component storage tape **100** which is fed by the tape feeding unit **3** and travels on the travel path **5**. The compo-

nent exposing unit **6** includes a cover tape raising unit **61**, a cover tape pre-process unit **62**, and a cover tape post-process unit **63**.

FIG. **6** is a diagram illustrating the configuration of the cover tape raising unit **61** in the component exposing unit **6**. The cover tape raising unit **61** is disposed on the first path part **51** on the travel path **5**. The cover tape raising unit **61** performs a raising process for raising the cover tape **102** to the +Z direction side (the upper direction side) with respect to the carrier tape **101** by coming into contact with the cover tape **102** of the component storage tape **100** traveling on the first path part **51** of the travel path **5**. The raising process for the cover tape **102** by the cover tape raising unit **61** exposes the components P inside the component storage parts **101***a* of the component storage tape **100**.

In the present embodiment, the cover tape raising unit **61** comes into contact with a cut part **102***a* of the cover tape **102** cut by a cover tape cutting member **622** included in the cover tape pre-process unit **62** (described below) to perform the raising process for the cut cover tape **102**. The cover tape cutting member **622** of the cover tape pre-process unit **62** cuts the cover tape **102** at a predetermined position (e.g., a central position) between the ends in the width direction of the cover tape **102**. Further, the cut part **102***a* of the cover tape **102** cut by the cover tape cutting member **622** linearly extends along the travel path **5**.

The cover tape raising unit **61** includes a raised region expanding part **611** and a raised region holding part **612**. The raised region expanding part **611** is a region part on the upstream side in the tape feeding direction H in the cover tape raising unit **61**. The tip of an upstream end **611**A in the tape feeding direction H of the raised region expanding part **611** constitutes a most upstream end **61**A of the cover tape raising unit **61** and serves as a starting point of the contact with the cover tape **102**. The raised region expanding part **611** expands a raised region of the cover tape **102** to the +Z direction side (the upper direction side) with respect to the carrier tape **101** to a range from a raising starting point to the fused parts **103**. The raising starting point of the cover tape **102** is a starting point of the contact with the most upstream end **61**A of the cover tape raising unit **61** in the cover tape **102** and, in the present embodiment, located on the cut part **102***a* of the cover tape **102** cut by the cover tape cutting member **622**. Further, the upstream end **611**A in the tape feeding direction H of the raised region expanding part **611** is fixed to the cover member **7** (described below).

The raised region expanding part **611** includes a first region expanding piece **6111** and a second region expanding piece **6112**. The first region expanding piece **6111** and the second region expanding piece **6112** are plate-like members each having a predetermined length in the tape feeding direction H and connected to each other at their upstream ends in the tape feeding direction H. The connected part between the first region expanding piece **6111** and the second region expanding piece **6112** constitutes the upstream end **611**A in the tape feeding direction H of the raised region expanding part **611**.

The first region expanding piece **6111** extends in a manner to approach an end on one direction side (the +X direction side) in the width direction (the X-axis direction) in the travel path **5** from the upstream end in the tape feeding direction H as the part connected with the second region expanding piece **6112** toward the downstream end. The upstream end in the tape feeding direction H of the first region expanding piece **6111** comes into contact with the cut part **102***a* of the cut cover tape **102**. An edge on the −Z direction side of the downstream end in the tape feeding direction H of the first region expanding piece **6111** comes into contact with a boundary between one direction side (the +X direction side) in the width direction of the cover tape **102** and the fused part **103**.

The second region expanding piece **6112** extends in a manner to approach an end on the other direction side (the −X direction side) in the width direction (the X-axis direction) in the travel path **5** from the upstream end in the tape feeding direction H as the part connected with the first region expanding piece **6111** toward the downstream end. The upstream end in the tape feeding direction H of the second region expanding piece **6112** comes into contact with the cut part **102***a* of the cut cover tape **102**. An edge on the −Z direction side of the downstream end in the tape feeding direction H of the second region expanding piece **6112** comes into contact with a boundary between the other direction side (the −X direction side) in the width direction of the cover tape **102** and the fused part **103**.

The raised region holding part **612** is connected to the downstream end in the tape feeding direction H of the raised region expanding part **611** through a connecting member **613**. The raised region holding part **612** is connected to the raised region expanding part **611** swingably about the connecting member **613**. A tip of the downstream end in the tape feeding direction H of the raised region holding part **612** constitutes a most downstream end **61**B of the cover tape raising unit **61** and serves as an end point of the contact with the cover tape **102**. The raised region holding part **612** holds the raised region of the cover tape **102**, the raised region being expanded to the range leading to the fused parts **103** by the raised region expanding part **611**, as it is. The cover tape raising unit **61** having the configuration in which the raised region holding part **612** is connected to the raised region expanding part **611** swingably about the connecting member **613** is swingable in response to a change in a traveling behavior of the component storage tape **100** on the first path part **51**. Thus, reduction in the stability of the raising process for the cover tape **102** by the cover tape raising unit **61** is prevented. The change in the traveling behavior of the component storage tape **100** on the first path part **51** will be described below.

The raised region holding part **612** includes a first region holding piece **6121** and a second region holding piece **6122**. The first region holding piece **6121** and the second region holding piece **6122** are plate-like members each having a predetermined length in the tape feeding direction H.

The first region holding piece **6121** extends along the first path part **51** in the travel path **5** from the upstream end toward the downstream end in the tape feeding direction H. The upstream end in the tape feeding direction H of the first region holding piece **6121** is connected to the downstream end of the first region expanding piece **6111** through the connecting member **613**. The first region holding piece **6121** is supported on the device body **2** swingably about the connecting member **613** with respect to the first region expanding piece **6111**. The downstream end in the tape feeding direction H of the first region holding piece **6121** constitutes the most downstream end **61**B of the cover tape raising unit **61**. An edge on the −Z direction side of the first region holding piece **6121** comes into contact with the boundary between one direction side (the +X direction side) in the width direction of the cover tape **102** and the fused part **103**.

The second region holding piece **6122** extends along the first path part **51** in the travel path **5** from the upstream end toward the downstream end in the tape feeding direction H. The upstream end in the tape feeding direction H of the

second region holding piece **6122** is connected to the downstream end of the second region expanding piece **6112** through the connecting member **613**. The second region holding piece **6122** is supported on the device body **2** swingably about the connecting member **613** with respect to the second region expanding piece **6112**. The downstream end in the tape feeding direction H of the second region holding piece **6122** constitutes the most downstream end **61**B of the cover tape raising unit **61**. An edge on the −Z direction side of the second region holding piece **6122** comes into contact with the boundary between the other direction side (the −X direction side) in the width direction of the cover tape **102** and the fused part **103**.

Next, the shape of the first path part **51** of the travel path **5** on which the cover tape raising unit **61** is disposed and buckling deformation of the carrier tape **101** during the raising process for the cover tape **102** of the component storage tape **100** will be described with reference to FIGS. **7** to **10** in addition to FIG. **6**. FIG. **7** is a diagram for describing the shape of the first path part **51** in the travel path **5** formed from the tape travel path forming unit **4**. FIGS. **8**A, **8**B and **8**C are diagrams for describing the shapes of the first region **511** and the second region **512** in the first path part **51** of the travel path **5**. FIG. **9** is a diagram for describing the shape of the second region **512** in the first path part **51** of the travel path **5**. FIG. **10** is a diagram illustrating a state of the buckling deformation of the carrier tape **101** during the raising process for the cover tape **102** of the component storage tape **100**.

As illustrated in FIG. **10**, the carrier tape **101** may deform in a buckling manner during the raising process for the cover tape **102** by the cover tape raising unit **61**. Referring to FIG. **9**, it is considered that the buckling deformation of the carrier tape **101** during the raising process for the cover tape **102** occurs due to a gap between a downstream end **102***b* in the tape feeding direction H of the cover tape **102** raised by the cover tape raising unit **61** and an upstream end **102***c* in the tape feeding direction H of the cover tape **102** spread out by the cover tape post-process unit **63** (described below).

In the cover tape **102** raised by the cover tape raising unit **61**, a tensile stress directing from the downstream end **102***b* in the tape feeding direction H toward the raising starting point (the starting point of the contact between the cover tape **102** and the most upstream end **61**A of the cover tape raising unit **61**) is generated by the gap. When the tensile stress is generated in the cover tape **102**, the buckling deformation of the carrier tape **101** is caused by the stress.

The size of the gap increases as the length K**1** between the fused parts **103** of the component storage tape **100** becomes longer and the raised region of the cover tape **102** by the raising process expands. That is, a deformation amount of the buckling deformation of the carrier tape **101** increases as the raised region of the cover tape **102** by the raising process expands. Further, the size of the gap increases as the length C in the cover tape raising unit **61** along the first path part **51** becomes shorter and a travel distance of the component storage tape **100** during the raising of the cover tape **102** becomes shorter. That is, the deformation amount of the buckling deformation of the carrier tape **101** increases as the travel distance of the component storage tape **100** during the raising of the cover tape **102** becomes shorter.

For example, when the size of the component storage parts **101***a* is increased to supply large components P, the length K**1** between the fused parts **103** becomes long. When the large components P are supplied using such a component storage tape **100**, the possibility of the occurrence of buckling deformation increases in view of the above behavior relating to the buckling deformation of the carrier tape **101**. In this case, the buckling deformation of the carrier tape **101** can be prevented by increasing the travel distance of the component storage tape **100** during the raising of the cover tape **102**.

In the present embodiment, as described above, the first path part **51** on which the cover tape raising unit **61** is disposed is inclined to one direction side (the −Z direction side, the lower direction side) in the Z-axis direction (the first direction, the upper-lower direction) which is perpendicular to the width direction of the travel path **5** (the X-axis direction) and the tape feeding direction H from the upstream side toward the downstream side in the tape feeding direction H. Accordingly, it is possible to increase the travel distance of the component storage tape **100** when the component storage tape **100** travels on the first path part **51** and passes through the cover tape raising unit **61** as compared to a case where, for example, the cover tape raising unit **61** is disposed on a travel path horizontally extending in the tape feeding direction H.

Further, the first path part **51** is not configured in such a manner that the most upstream end and the most downstream end in the tape feeding direction H are located at the same height position like the above conventional technique. Thus, in the cover tape **102** raised by the cover tape raising unit **61**, the generation of the tensile stress directing from the downstream end **102***b* in the tape feeding direction H toward the raising starting point is prevented. Thus, it is possible to prevent the buckling deformation of the carrier tape **101**, the buckling deformation being caused by the tensile stress of the cover tape **102**, during the raising process for the cover tape **102** by the cover tape raising unit **61**. Thus, an excellent traveling performance of the component storage tape **100** is maintained, and the components P can be efficiently supplied toward the component extracting position **21**.

Further, in the component supply device **1** having the configuration capable of preventing the buckling deformation of the carrier tape **101** during the raising process for the cover tape **102**, it is possible to reduce the length in the tape feeding direction H of the first path part **51** on which the cover tape raising unit **61** is disposed, that is, the length in the tape feeding direction H from the most upstream end to the most downstream end of the first path part **51**. Thus, the component supply device **1** can be downsized.

Further, as illustrated in FIGS. **6** and **7**, the first path part **51** on which the cover tape raising unit **61** is disposed includes the first region **511** on the most upstream side in the tape feeding direction H, the second region **512** which is continuous with the downstream side in the tape feeding direction H of the first region **511**, and the third region **513** which is continuous with the downstream side in the tape feeding direction H of the second region **512** as described above.

In the first path part **51**, a path part from the most upstream end **511**A in the tape feeding direction H of the first region **511** to the most downstream end **512**A in the tape feeding direction H of the second region **512** is formed in a shape extending along a virtual curve having an inflection point F**12** when viewed in the width direction of the travel path **5** (the X-axis direction). Specifically, the first region **511** of the first path part **51** is formed in a shape extending along a first virtual curve F**1** which projects in the other direction (the +Z direction, the upper direction) opposite to one direction (the −Z direction, the lower direction) in the Z-axis direction (the first direction, the upper-lower direction) when viewed in the width direction of the travel path **5** (the X-axis direction). The second region **512** of the first

path part **51** is formed in a shape extending along a second virtual curve F**2** which projects in one direction (the −Z direction, the lower direction) in the Z-axis direction (the first direction, the upper-lower direction) when viewed in the width direction of the travel path **5** (the X-axis direction).

Here, the shape of the path part from the most upstream end **511**A in the tape feeding direction H of the first region **511** to the most downstream end **512**A in the tape feeding direction H of the second region **512** is not particularly limited to any shape as long as the shape is inclined to the −Z direction side from the upstream side toward the downstream side in the tape feeding direction H. For example, the first region **511** extending along the first virtual curve F**1** and the second region **512** extending along the second virtual curve F**2** may have an arc shape as illustrated in FIG. **8**A, a bent shape including a plurality of segments coupled to each other as illustrated in FIG. **8**B, or a curved shape including a plurality of curves coupled to each other as illustrated in FIG. **8**C when viewed in the width direction of the travel path **5** (the X-axis direction).

In the first path part **51** viewed in the width direction of the travel path **5** (the X-axis direction), the first region **511** extending along the first virtual curve F**1** and the second region **512** extending along the second virtual curve F**2** are curved in different directions with respect to the Z-axis direction (the first direction, the upper-lower direction) and have opposite signs of the curvature. When the component storage tape **100** travels along the first path part **51** as described above, a force of bending acts on the component storage tape **100** in opposite directions with respect to the Z-axis direction (the first direction, the upper-lower direction) between when the component storage tape **100** passes through the first region **511** and when the component storage tape **100** passes through the second region **512**. Thus, for example, in the first path part **51**, when the cover tape raising unit **61** is disposed across the first region **511** and the second region **512**, there is a possibility that the stability of the raising process for the cover tape **102** by the cover tape raising unit **61** is reduced.

Thus, as illustrated in FIG. **6**, the cover tape raising unit **61** is disposed in such a manner that the most upstream end **61**A in the tape feeding direction H as the starting point of the contact with the cover tape **102** is located on or near a boundary line S**1** between the first region **511** and the second region **512** in the first path part **51**. In such a configuration, since the most upstream end **61**A of the cover tape raising unit **61** is located on or near the boundary line S**1** between the first region **511** and the second region **512**, the cover tape raising unit **61** is not located across the first region **511** and the second region **512**, but located in the second region **512**. Thus, the reduction in the stability of the raising process for the cover tape **102** by the cover tape raising unit **61** is prevented.

Further, the component storage tape **100** travels while bending in the first region **511** and the second region **512** of the first path part **51**. Here, in the component storage tape **100** traveling on the first path part **51**, a bending direction during traveling and the traveling behavior on the first path part **51** change at the inflection point F**12** between the first virtual curve F**1** extending along the first region **511** and the second virtual curve F**2** extending along the second region **512** between when the component storage tape **100** is fed by the first feeding unit **31** which is disposed on the upstream side of the first path part **51** and when the component storage tape **100** is fed by the second feeding unit **32** which is disposed on the downstream side of the first path part **51**. Such a change in the traveling behavior of the component storage tape **100** on the first path part **51** occurs not only in the loading operation in which the component storage tape **100** is fed in the tape feeding direction H toward the component extracting position **21**, but also in the unloading operation in which the component storage tape **100** is fed in the −Y direction which is opposite to the tape feeding direction H.

Specifically, in the loading operation, the component storage tape **100** fed by the first feeding unit **31** bends to the +Z direction side (the upper direction side) in the first region **511** and bends to the −Z direction side (the lower direction side) in the second region **512**. Further, the component storage tape **100** fed by the second feeding unit **32** bends to the −Z direction side (the lower direction side) in the first region **511** and bends to the +Z direction side (the upper direction side) in the second region **512**.

In the cover tape raising unit **61** of the present embodiment, as described above, only the upstream end **611**A of the raised region expanding part **611** is fixed to the cover member **7** (described below), and the raised region holding part **612** is connected to the raised region expanding part **611** swingably about the connecting member **613**. Accordingly, the cover tape raising unit **61** is swingable in response to the change in the traveling behavior of the component storage tape **100** on the first path part **51**. Thus, the reduction in the stability of the raising process for the cover tape **102** by the cover tape raising unit **61** is prevented.

Further, as illustrated in FIG. **4**, the first path part **51** is formed from the first to sixth guide rollers **42**, **43**, **44**, **45**, **46**, **47** together with the guide faces **411** of the pair of guide walls **41** as described above. Each of the first to sixth guide rollers **42**, **43**, **44**, **45**, **46**, **47** is rotatable around the axis extending in the X-axis direction. Thus, even when the traveling behavior of the component storage tape **100** on the first path part **51** changes, it is possible to reduce the traveling resistance of the component storage tape **100** when the component storage tape **100** travels on the first path part **51**.

Further, when the component storage tape **100** travels on the first path part **51**, the face on the −Z direction side (the lower face) thereof is guided by the guide faces **411** of the pair of guide walls **41** and the first guide roller **42** and the second guide roller **43**. On the other hand, the face on the +Z direction side (the upper face) of the component storage tape **100** is guided by the third to sixth guide rollers **44**, **45**, **46**, **47**. That is, the tape travel path forming unit **4** is not provided with a guide wall having a continuous guide face as a configuration for guiding the face on the +Z direction side (the upper face) of the component storage tape **100** in order to more reliably reduce the traveling resistance when the traveling behavior of the component storage tape **100** on the first path part **51** changes.

Next, a configuration for more reliably preventing the buckling deformation of the carrier tape **101** during the raising process for the cover tape **102** will be described with reference to FIGS. **7** and **9**. It is desired that the shape of the second region **512** of the first path part **51** on which the cover tape raising unit **61** is disposed on the travel path **5** be designed on the basis of a threshold T (refer to FIG. **9**) corresponding to the gap between the downstream end **102***b* in the tape feeding direction H of the cover tape **102** raised by the cover tape raising unit **61** and the upstream end **102***c* in the tape feeding direction H of the cover tape **102** spread out by the cover tape post-process unit **63** (described below). As illustrated in FIG. **9**, the threshold T can be obtained from the following equation (1).

$$T = W \cdot \sin 2\theta = 2W \cdot \sin\theta \cdot \cos\theta \quad (1)$$

In the above equation (1), "W" denotes a distance in the width direction of the travel path **5** (the X-axis direction) between the most upstream end **61**A in the tape feeding direction H as the starting point of the contact with the cover tape **102** and the most downstream end **61**B in the tape feeding direction H as the end point of the contact with the cover tape **102** in the cover tape raising unit **61**. Further, in the above equation (1), "θ" denotes an angle around the raising starting point of the cover tape **102** raised by the cover tape raising unit **61** (the starting point of the contact with the most upstream end **61**A of the cover tape raising unit **61** in the cover tape **102**) as illustrated in FIG. **9**.

Further, as illustrated in FIG. **9**, "sin θ" and "cos θ" in the above equation (1) are obtained from the following equations (2) and (3), respectively.

$$\sin\theta = W/\mathrm{sqrt}(C^2+W^2) \tag{2}$$

$$\cos\theta = C/\mathrm{sqrt}(C^2+W^2) \tag{3}$$

In the above equations (2) and (3), "C" denotes a length along the second region **512** of the first path part **51** in the cover tape raising unit **61**.

The following equation (I) is obtained as an equation that defines the threshold T by substituting "sin θ" represented by equation (2) and "cos θ" represented by equation (3) into equation (1).

$$T = 2C\cdot W^2/(C^2+W^2) \tag{I}$$

Further, in the present embodiment, a difference value (L−d) between a length L of an arc (corresponding to the second virtual curve F**2**) and a length d of a chord F**5** in a sector F**4** (a central angle α) corresponding to the second virtual curve F**2** which defines the shape of the second region **512** of the first path part **51** on which the cover tape raising unit **61** is disposed on the travel path **5** is set to be larger than the threshold T defined by the above equation (I). Accordingly, during the raising process for the cover tape **102** by the cover tape raising unit **61** which is disposed on the second region **512** of the first path part **51**, it is possible to more reliably prevent the buckling deformation of the carrier tape **101**, the buckling deformation being caused by the tensile stress of the cover tape **102**.

Further, as illustrated in FIGS. **6** and **7**, the third region **513** which is continuous with the downstream side in the tape feeding direction H of the second region **512** on which the cover tape raising unit **61** is disposed in the first path part **51** is formed in a shape extending along a third virtual curve F**3** which projects in the +Z direction (the upper direction) when viewed in the width direction of the travel path **5** (the X-axis direction).

As described above, the second feeding unit **32** which is provided with the pair of second sprockets **321** is disposed on a most downstream end **513**A in the tape feeding direction H of the third region **513**, the most downstream end **513**A corresponding to the most downstream end in the tape feeding direction H of the first path part **51** in the travel path **5**. The third region **513** is formed in the shape extending along the third virtual curve F**3** which projects in the +Z direction (the upper direction) in order to improve an engagement performance of the engagement holes **101***b* of the carrier tape **101** on the tip of the component storage tape **100** which is fed by the first feeding unit **31** and travels in the third region **513** with the teeth **321***a* of the pair of second sprockets **321**. The tape feeding unit **3** is not necessarily provided with the second feeding unit **32**. However, when the tape feeding unit **3** is provided with the second feeding unit **32**, the teeth **321***a* of the second sprockets **321** are fitted in and engaged with the engagement holes **101***b* of the component storage tape **100** which is fed by the first feeding unit **31** and travels on the first path part **51**, which enables the component storage tape **100** to be reliably received. Further, the second feeding unit **32** makes it possible to reliably feed the component storage tape **100** received by the second feeding unit **32** toward the third feeding unit **33** which is disposed at the position corresponding to the component extracting position **21** in the third path part **53** on the downstream side in the tape feeding direction H of the first path part **51**.

The height position of the most downstream end **513**A in the tape feeding direction H of the third region **513** is set taking into consideration the engagement performance of the engagement holes **101***b* of the carrier tape **101** with respect to the teeth **321***a* of the pair of second sprockets **321** and an effect of preventing the buckling deformation of the carrier tape **101** during the raising process for the cover tape **102**. The height position of the most downstream end **513**A of the third region **513** is set to be different from the height position of the most upstream end **511**A of the first region **511**, the most upstream end **511**A corresponding to the most upstream end in the tape feeding direction H of the first path part **51**.

That is, as illustrated in FIG. **7**, a distance K**6** in the Z-axis direction (the upper-lower direction) between the most downstream end **512**A of the second region **512** and the most downstream end **513**A of the third region **513** is set to be shorter than a distance K**5** in the Z-axis direction (the upper-lower direction) between the most upstream end **511**A of the first region **511** and the most downstream end **512**A of the second region **512**. When the tape feeding unit **3** is not provided with the second feeding unit **32**, the first path part **51** may not include the third region **513** and horizontally extend from the most downstream end **512**A of the second region **512** toward the third path part **53**. Alternatively, the second feeding unit **32** may be disposed on a part horizontally extending from the most downstream end **512**A of the second region **512**.

Further, as described above, the sixth guide roller **47** which guides both the ends in the X-axis direction of the face on the +Z direction side (the upper face) of the component storage tape **100** is disposed on the third region **513** of the first path part **51**. The sixth guide roller **47** guides the component storage tape **100** such that the tip of the component storage tape **100** which is fed by the first feeding unit **31** and travels in the third region **513** comes into contact with the roots of the teeth **321***a* of the pair of second sprockets **321**. Accordingly, it is possible to achieve an excellent engagement performance of the engagement holes **101***b* of the carrier tape **101** on the tip of the component storage tape **100** with the teeth **321***a* of the pair of second sprockets **321**.

Next, the cover tape pre-process unit **62** and the cover tape post-process unit **63** of the component exposing unit **6** will be described with reference to FIGS. **1** and **5**.

The cover tape pre-process unit **62** is disposed on the second path part **52**, which is continuous with the upstream side in the tape feeding direction H of the first path part **51** in the travel path **5**, away from the cover tape raising unit **61**. The cover tape pre-process unit **62** performs a pre-process for cutting the cover tape **102** on the component storage tape **100** which is fed by the first feeding unit **31** and travels on the second path part **52** with the tip of the component storage tape **100** being a free end prior to the raising process for the cover tape **102** by the cover tape raising unit **61**. Accord-

ingly, the cover tape raising unit **61** smoothly comes into contact with the cover tape **102** of the component storage tape **100**, and the raising process for the cover tape **102** by the cover tape raising unit **61** is smoothly performed.

Further, the component storage tape **100** is fed by the first feeding unit **31** with the tip of the component storage tape **100** being a free end and travels on the second path part **52** and the first path part **51** from the upstream side toward the downstream side of the travel path **5**. Here, the cover tape pre-process unit **62** is disposed on the second path part **52** away from the cover tape raising unit **61** which is disposed on the first path part **51**. Thus, when the component storage tape **100** travels on the second path part **52** on the upstream side of the first path part **51** in the travel path **5** and passes through the cover tape pre-process unit **62**, the raising process has not yet been performed on the cover tape **102** of the component storage tape **100**. As a result, in the component storage tape **100** traveling on the second path part **52** on which the cover tape pre-process unit **62** is disposed, it is possible to prevent the buckling deformation of the carrier tape **101**, the buckling deformation being caused by the tensile stress of the cover tape **102** associated with the raising process.

The component storage tape **100** after the raising process for the cover tape **102** by the cover tape raising unit **61** is fed to the third path part **53** on the downstream side of the first path part **51** in the travel path **5** by the second feeding unit **32**. The cover tape post-process unit **63** is disposed on the third path part **53**. The cover tape post-process unit **63** performs a post-process for spreading out the cover tape **102** raised by the cover tape raising unit **61** in the width direction of the component storage tape **100**. Accordingly, an exposed degree of the component P inside the component storage part **101***a* of the component storage tape **100** increases. Thus, it is possible to improve a removal performance for the component P at the component extracting position **21**.

The detailed configuration of the cover tape pre-process unit **62** of the component exposing unit **6** will be described with reference to FIGS. **11**A and **11**B. FIGS. **11**A and **11**B are diagrams illustrating the configuration of the cover tape pre-process unit **62** of the component exposing unit **6**. The cover tape pre-process unit **62** includes an insertion member **621**, a cover tape cutting member **622**, and a support member **623**.

The insertion member **621** is inserted between the cover tape **102** and the carrier tape **101** in the component storage tape **100** which is fed by the first feeding unit **31** with the tip of the component storage tape **100** being a free end and travels on the second path part **52**. The insertion member **621** is formed in a flat-plate shape. The insertion member **621** includes a base part **6211** and a tip part **6212** which is continuous with the upstream end in the tape feeding direction H of the base part **6211**. The cover member **7** (described below) is connected to a downstream end **6211***a* in the tape feeding direction H of the base part **6211** of the insertion member **621**.

FIG. **12** is a diagram illustrating a state in which the insertion member **621** of the cover tape pre-process unit **62** is inserted between the cover tape **102** and the carrier tape **101** of the component storage tape **100**. In the insertion member **621**, the tip part **6212** is inclined upward with respect to the base part **6211** in such a manner that the tip part **6212** is inclined to the other direction side (the +Z direction side, the upper direction side) in the Z-axis direction (the first direction, the upper-lower direction) from the part connected with the base part **6211** toward an upstream end **6212***a* in the tape feeding direction H. In other words, as illustrated in FIG. **12**, in a state where the insertion member **621** is inserted between the cover tape **102** and the carrier tape **101**, the base part **6211** is substantially parallel to the cover tape **102**, and the tip part **6212** is inclined toward the cover tape **102** away from the carrier tape **101**.

The inclined structure of the tip part **6212** of the insertion member **621** as described above makes it possible to prevent the tip part **6212** from making contact with a storage part connecting region part **101***c* which is a region part located between adjacent component storage parts **101***a* in the carrier tape **101** when the component storage tape **100** is fed by the first feeding unit **31** with the insertion member **621** inserted between the cover tape **102** and the carrier tape **101**. Thus, an excellent traveling performance of the component storage tape **100** is maintained, and the components P can be efficiently supplied toward the component extracting position **21**.

Further, the tip part **6212** of the insertion member **621** is formed in a tapered shape. Accordingly, an insertability of the insertion member **621** inserted between the cover tape **102** and the carrier tape **101** is improved. Further, the insertion member **621** is supported by the support member **623**. In the present embodiment, the support member **623** is disposed on the upper face of the cover member **7** (described below) which is connected to the downstream end **6211***a* in the tape feeding direction H of the base part **6211** of the insertion member **621** and fixed to the device body **2**. With such a configuration, the support member **623** supports the insertion member **621** through the cover member **7**.

The cover tape cutting member **622** cuts the cover tape **102** of the component storage tape **100** which is fed by the first feeding unit **31** with the tip of the component storage tape **100** being a free end and travels on the second path part **52**. The cover tape cutting member **622** cuts the cover tape **102** at a predetermined position (e.g., a central position) between the ends in the width direction of the cover tape **102**. The cut part **102***a* of the cover tape **102** cut by the cover tape cutting member **622** linearly extends along the travel path **5**.

The cover tape cutting member **622** includes a blade part **6221** which cuts the cover tape **102** and a holding part **6222**. The holding part **6222** includes a holding face **6222***a* which holds the blade part **6221** so that the blade edge is exposed.

The cover tape cutting member **622** is supported by the support member **623** through the cover member **7** in such a manner that at least a face opposite to the holding face **6222***a* in a region part **6222***b* on the upstream side in the tape feeding direction H of the holding part **6222** abuts on a face **6211***b* (the face on the cover tape **102** side) on the other direction side (the +Z direction side, the upper direction side) in the Z-axis direction (the first direction, the upper-lower direction) of the base part **6211** of the insertion member **621**. Further, in the cover tape cutting member **622**, the blade part **6221** which is held by the holding face **6222***a* of the holding part **6222** faces the other direction side (the +Z direction side, the upper direction side) in the Z-axis direction (the first direction, the upper-lower direction). In such a configuration, when the component storage tape **100** traveling on the second path part **52** of the travel path **5** passes through the cover tape cutting member **622**, the insertion member **621** is interposed between an upstream end **6222***c* of the cover tape cutting member **622** and the carrier tape **101**. Thus, it is possible to prevent the upstream end **6222***c* of the cover tape cutting member **622** from making contact with the component P stored in the component storage part **101***a* of the carrier tape **101**. Thus, it is

possible to prevent the component P from being damaged by contact with the cover tape cutting member **622**.

Further, in the holding part **6222** of the cover tape cutting member **622**, the holding face **6222***a* is desirably an inclined plane which is inclined downward from the downstream side toward the upstream side in the tape feeding direction H. Accordingly, when the component storage tape **100** travels on the second path part **52** of the travel path **5** and passes through the cover tape cutting member **622**, the component storage tape **100** is guided along the holding face **6222***a*, which is an inclined plane, of the holding part **6222**. As a result, it is possible to reduce the traveling resistance when the component storage tape **100** passes through the cover tape cutting member **622**.

FIGS. **13**A and **13**B are diagrams illustrating a state in which the cover tape cutting member **622** of the cover tape pre-process unit **62** cuts the cover tape **102** of the component storage tape **100**. In a state where the insertion member **621** and the cover tape cutting member **622** are inserted between the cover tape **102** and the carrier tape **101** in the component storage tape **100** traveling on the second path part **52** of the travel path **5**, a tensile stress in a direction away from the carrier tape **101** is applied to the cover tape **102**. The cover tape **102** is smoothly cut by the blade part **6221** of the cover tape cutting member **622** by the application of such a tensile stress to the cover tape **102**.

On the other hand, when the tensile stress is applied to the cover tape **102**, as illustrated in FIG. **13**A, the carrier tape **101** may deform in a buckling manner. The buckling deformation of the carrier tape **101** reduces the tensile stress applied to the cover tape **102**. When the tensile stress applied to the cover tape **102** is excessively reduced, smooth cutting of the cover tape **102** by the blade part **6221** of the cover tape cutting member **622** is obstructed.

Thus, as illustrated in FIG. **12**, a distance K**7** between the upstream end **6212***a* in the tape feeding direction H of the tip part **6212** in the insertion member **621** and the upstream end **6222***c* in the tape feeding direction H of the holding part **6222** in the cover tape cutting member **622** is set to be equal to or more than the sum of a width dimension K**8** in the tape feeding direction H of each of the component storage parts **101***a* of the component storage tape **100** and an interval K**9** between adjacent two of the component storage parts **101***a*. Accordingly, as illustrated in FIG. **13**B, it is possible to prevent the buckling deformation of the carrier tape **101** in a state where the insertion member **621** and the cover tape cutting member **622** are inserted between the cover tape **102** and the carrier tape **101**. Thus, it is possible to maintain smooth cutting of the cover tape **102** by the blade part **6221** of the cover tape cutting member **622**.

FIGS. **14**A and **14**B are diagrams illustrating a state of swings of the insertion member **621** and the cover tape cutting member **622** of the cover tape pre-process unit **62**. The insertion member **621** may be supported by the support member **623** through the cover member **7** swingably around a predetermined axis J**1** extending in the width direction of the second path part **52** of the travel path **5** (the X-axis direction). Further, at least the region part **6222***b* on the upstream side in the tape feeding direction H of the holding part **6222** in the cover tape cutting member **622** abuts on the face **6211***b* (the face on the cover tape **102** side) on the other direction side (the +Z direction side, the upper direction side) in the Z-axis direction (the first direction, the upper-lower direction) of the base part **6211** of the insertion member **621** so as to enable the cover tape cutting member **622** to swing in conjunction with the swing of the insertion member **621**. Accordingly, for example, when the component storage tape **100** travels on the travel path **5** while bending, the insertion member **621** and the cover tape cutting member **622** which are inserted between the cover tape **102** and the carrier tape **101** are swingable in response to the bending of the component storage tape **100**. Thus, it is possible to stably prevent the tip part **6212** of the insertion member **621** from making contact with the storage part connecting region part **101***c* in the carrier tape **101**.

Next, the cover member **7** included in the component supply device **1** will be described with reference to FIG. **15** in addition to FIGS. **1** and **5**. FIG. **15** is a diagram illustrating the cover member **7** included in the component supply device **1**. The cover member **7** covers at least a part of an opening of each of the component storage parts **101***a* of the component storage tape **100** after an exposing process for exposing the component P inside the component storage part **101***a* by the component exposing unit **6**. With the configuration in which the component supply device **1** is provided with the cover member **7**, it is possible to restrict jumping out of the components P from the component storage parts **101***a* by the cover member **7** when the component storage tape **100** after the exposing process is fed by the tape feeding unit **3**. Thus, it is possible to stably supply the components to the component extracting position **21** by the component supply device **1** and efficiently supply the components toward the component extracting position **21**.

In the present embodiment, the cover member **7** extends from the downstream end **6211***a* in the tape feeding direction H of the base part **6211** of the insertion member **621** up to the component extracting position **21** along the travel path **5**. Accordingly, at least a part of the opening of each of the component storage parts **101***a* in the component storage tape **100** traveling on the travel path **5** is covered with the cover member **7** from the downstream end **6211***a* of the base part **6211** of the insertion member **621** up to the component extracting position **21**. Thus, it is possible to reliably restrict jumping out of the components P from the component storage parts **101***a* by the cover member **7** in the component storage tape **100** after the exposing process.

Further, the cover member **7** which is connected to the downstream end **6211***a* of the base part **6211** of the insertion member **621** covers the component storage parts **101***a* along the travel path **5** in a state where the cover member **7** is inserted between the cover tape **102** and the carrier tape **101** of the component storage tape **100** fed by the tape feeding unit **3**. Thus, the cover member **7** has a function of guiding traveling of the component storage tape **100** fed by the tape feeding unit **3** in a state where the cover member **7** is inserted between the cover tape **102** and the carrier tape **101**. Thus, the cover member **7** forms the travel path **5** and constitutes the tape travel path forming unit **4** together with the pair of guide walls **41** and the first to sixth guide rollers **42**, **43**, **44**, **45**, **46**, **47**.

As described above, the first path part **51** of the travel path **5** includes the first region **511** and the second region **512** which are formed in the shape extending along the virtual curve having the inflection point F**12** when viewed in the width direction of the travel path **5** (the X-axis direction). The component storage tape **100** travels while bending in the first region **511** and the second region **512** of the first path part **51**. Thus, there is a possibility that, in the component storage tape **100** traveling in the first region **511** and the second region **512** of the first path part **51**, a frictional force caused by contact between the cover member **7** which covers the component storage parts **101***a* and the carrier tape **101** increases.

Thus, the cover member **7** desirably has flexibility. In such a configuration, when the component storage tape **100** travels along the first region **511** and the second region **512** of the first path part **51** while bending, the cover member **7** bends in response to the bending of the component storage tape **100**. Accordingly, in the component storage tape **100** traveling in the first region **511** and the second region **512** of the first path part **51**, it is possible to prevent the increase in the frictional force caused by the contact between the cover member **7** which covers the component storage parts **101***a* and the carrier tape **101**. Thus, it is possible to reduce the traveling resistance when the component storage tape **100** travels on the travel path **5**.

FIG. **16** is a diagram illustrating a modification of the cover member **7**. FIG. **17** is an enlarged view of the cover member **7** of FIG. **16**. The cover member **7** having flexibility may include a film member having a sheet-like shape as illustrated in FIG. **15**. Further, the cover member **7** having flexibility may also include a plurality of linear members which are arrayed at predetermined intervals in the width direction of the travel path **5** (the X-axis direction) as illustrated in FIGS. **16** and **17**.

Further, as illustrated in FIG. **11**, the upstream end in the tape feeding direction H of the cover member **7**, the upstream end being a part connected with the downstream end **6211***a* in the tape feeding direction H of the base part **6211** of the insertion member **621**, is supported by the support member **623**. Further, the downstream end in the tape feeding direction H of the cover member **7** is supported by the device body **2** from the upper side.

As described above, in the component storage tape **100** traveling on the first path part **51**, the bending direction during traveling and the traveling behavior on the first path part **51** change at the inflection point F**12** between the first virtual curve F**1** extending along the first region **511** and the second virtual curve F**2** extending along the second region **512** between when the component storage tape **100** is fed by the first feeding unit **31** which is disposed on the upstream side of the first path part **51** and when the component storage tape **100** is fed by the second feeding unit **32** which is disposed on the downstream side of the first path part **51**.

With the configuration in which only the upstream end and the downstream end of the cover member **7** are supported by the support member **623** and the device body **2**, respectively, the cover member **7** bends in response to the change in the traveling behavior of the component storage tape **100** on the first path part **51** of the travel path **5**. Accordingly, it is possible to reduce the traveling resistance when the component storage tape **100** with the component storage parts **101***a* covered with the cover member **7** travels on the first path part **51**.

Second Embodiment

FIG. **18** is a diagram schematically illustrating the configuration of a component exposing unit **60** included in a component supply device **10** according to a second embodiment of the present disclosure. The component supply device **1** according to the first embodiment described above performs the pre-process for cutting the cover tape **102** as one process in the exposing process for exposing the components P inside the component storage parts **101***a* of the component storage tape **100**. On the other hand, the component supply device **10** according to the second embodiment performs a pre-process for separating a cover tape **102** from a carrier tape **101** as one process in an exposing process. The component supply device **10** according to the second embodiment is configured in a manner similar to the component supply device **1** according to the first embodiment except the configuration of the component exposing unit **60**. In this manner, the component supply device **10** according to the second embodiment includes parts similar to the component supply device **1** according to the first embodiment. Thus, in the following description and the drawings, corresponding similar parts will be denoted by the same reference signs, and description thereof will be omitted.

The component exposing unit **60** included in the component supply device **10** includes a cover tape raising unit **601**, a cover tape pre-process unit **602**, and a cover tape post-process unit **603**.

FIG. **19** is a diagram illustrating the configuration of the cover tape raising unit **601** in the component exposing unit **60** according to the second embodiment. The cover tape raising unit **601** is disposed on a first path part **51** on a travel path **5**. The cover tape raising unit **601** performs a raising process for raising the cover tape **102** to the +Z direction side (the upper direction side) with respect to the carrier tape **101** by coming into contact with the cover tape **102** of the component storage tape **100** traveling on the first path part **51** of the travel path **5** to expose components P.

In the present embodiment, the cover tape raising unit **601** comes into contact with the cover tape **102** separated from the carrier tape **101** by an insertion member **6021** included in the cover tape pre-process unit **602** (described below) to perform the raising process for the separated cover tape **102**. The insertion member **6021** of the cover tape pre-process unit **602** separates an end on one direction side in the width direction of the cover tape **102** along a fused part **103**.

The cover tape raising unit **601** is a plate-like member having a predetermined length in the tape feeding direction H. An upstream end **601**A in the tape feeding direction H of the cover tape raising unit **601** is fixed to a cover member **7**. The cover tape raising unit **601** extends from an end on one direction side (the +X direction side) in the width direction (the X-axis direction) to an end on the other direction side (the −X direction side) in the width direction (the X-axis direction) in the travel path **5** from the upstream side toward the downstream side in the tape feeding direction H. That is, in the cover tape raising unit **601**, a most upstream end **601**Aa which serves as a starting point of the contact with the cover tape **102** is located on the end on one direction side (the +X direction side) in the width direction (the X-axis direction) in the travel path **5**. Further, a most downstream end **601**B which serves as an end point of the contact with the cover tape **102** is located on the end on the other direction side (the −X direction side) in the width direction (the X-axis direction) in the travel path **5**.

In the cover tape raising unit **601** having the above configuration, the most upstream end **601**Aa comes into contact with the end on one direction side (the +X direction side) in the width direction of the cover tape **102** separated by the insertion member **6021**. The most downstream end **601**B of the cover tape raising unit **601** comes into contact with a boundary between the other direction side (the −X direction side) in the width direction of the cover tape **102** and the fused part **103**.

Also in the component supply device **10** according to the second embodiment, in a manner similar to the component supply device **1** according to the first embodiment described above, the first path part **51** on which the cover tape raising unit **601** is disposed is inclined to one direction side (the −Z direction side, the lower direction side) in the Z-axis direction (the first direction, the upper-lower direction) from the

upstream side toward the downstream side in the tape feeding direction H. Accordingly, it is possible to increase a travel distance of the component storage tape **100** when the component storage tape **100** travels on the first path part **51** and passes through the cover tape raising unit **601**.

Further, in the cover tape **102** raised by the cover tape raising unit **601**, the generation of a tensile stress directing from the downstream end **102***b* in the tape feeding direction H toward the raising starting point is prevented. Thus, it is possible to prevent buckling deformation of the carrier tape **101**, the buckling deformation being caused by the tensile stress of the cover tape **102**, during the raising process for the cover tape **102** by the cover tape raising unit **601**. Thus, an excellent traveling performance of the component storage tape **100** is maintained, and the components P can be efficiently supplied toward the component extracting position **21**.

The cover tape pre-process unit **602** is disposed on a second path part **52**, which is continuous with the upstream side in the tape feeding direction H of the first path part **51** in the travel path **5**, away from the cover tape raising unit **601**. The cover tape pre-process unit **602** performs a pre-process for separating the cover tape **102** from the carrier tape **101** on one end in the width direction of the component storage tape **100** which is fed by a first feeding unit **31** and travels on the second path part **52** with a tip of the component storage tape **100** being a free end prior to the raising process for the cover tape **102** by the cover tape raising unit **601**. Accordingly, the cover tape raising unit **601** smoothly comes into contact with the cover tape **102** of the component storage tape **100**, and the raising process for the cover tape **102** by the cover tape raising unit **601** is smoothly performed.

Further, the component storage tape **100** is fed by the first feeding unit **31** with the tip of the component storage tape **100** being a free end and travels on the second path part **52** and the first path part **51** from the upstream side toward the downstream side of the travel path **5**. Here, the cover tape pre-process unit **602** is disposed on the second path part **52** away from the cover tape raising unit **601** which is disposed on the first path part **51**. Thus, when the component storage tape **100** travels on the second path part **52** on the upstream side of the first path part **51** in the travel path **5** and passes through the cover tape pre-process unit **602**, the raising process has not yet been performed on the cover tape **102** of the component storage tape **100**. As a result, in the component storage tape **100** traveling on the second path part **52** on which the cover tape pre-process unit **602** is disposed, it is possible to prevent the buckling deformation of the carrier tape **101**, the buckling deformation being caused by the tensile stress of the cover tape **102** associated with the raising process.

The component storage tape **100** after the raising process for the cover tape **102** by the cover tape raising unit **601** is fed to a third path part **53** on the downstream side of the first path part **51** in the travel path **5** by the second feeding unit **32**. The cover tape post-process unit **603** is disposed on the third path part **53**. The cover tape post-process unit **603** performs a post-process for spreading out the cover tape **102** raised by the cover tape raising unit **601** in the width direction of the component storage tape **100**. Accordingly, an exposed degree of the component P inside the component storage part **101***a* of the component storage tape **100** increases. Thus, it is possible to improve a removal performance for the component P at the component extracting position **21**.

The detailed configuration of the cover tape pre-process unit **602** of the component exposing unit **60** will be described with reference to FIGS. **20**A and **20**B. FIGS. **20**A and **20**B are diagrams illustrating the cover tape pre-process unit **602** of the component exposing unit **60** according to the second embodiment. The cover tape pre-process unit **602** includes an insertion member **6021** and a support member **6022**.

The insertion member **6021** is inserted between the cover tape **102** and the carrier tape **101** on an end on one direction side (the +X direction side) in the width direction of the component storage tape **100** which is fed by the first feeding unit **31** with the tip of the component storage tape **100** being a free end and travels on the second path part **52**. The insertion member **6021** separates the end on one direction side (the +X direction side) in the width direction of the cover tape **102** along the fused part **103**.

The insertion member **6021** is formed in a flat-plate shape. The insertion member **6021** includes a base part **60211** and a tip part **60212** which is continuous with the upstream end in the tape feeding direction H of the base part **60211**. The cover member **7** is connected to a downstream end **60211***a* in the tape feeding direction H of the base part **60211** of the insertion member **6021**.

FIGS. **21**A and **21**B are diagrams illustrating a state in which the insertion member **6021** of the cover tape pre-process unit **602** is inserted between the cover tape **102** and the carrier tape **101** of the component storage tape **100**. In the insertion member **6021**, the tip part **60212** is inclined upward with respect to the base part **60211** in such a manner that the tip part **60212** is inclined to the other direction side (the +Z direction side, the upper direction side) in the Z-axis direction (the first direction, the upper-lower direction) from the part connected with the base part **60211** toward an upstream end **60212***a* in the tape feeding direction H. In other words, as illustrated in FIGS. **21**A and **21**B, in a state where the insertion member **6021** is inserted between the cover tape **102** and the carrier tape **101**, the base part **60211** is substantially parallel to the cover tape **102**, and the tip part **60212** is inclined toward the cover tape **102** away from the carrier tape **101**.

The inclined structure of the tip part **60212** of the insertion member **6021** as described above makes it possible to prevent the tip part **60212** from making contact with a storage part connecting region part **101***c* in the carrier tape **101** when the component storage tape **100** is fed by the first feeding unit **31** with the insertion member **6021** inserted between the cover tape **102** and the carrier tape **101**. Thus, an excellent traveling performance of the component storage tape **100** is maintained, and the components P can be efficiently supplied toward the component extracting position **21**. Further, the insertion member **6021** is supported by the support member **6022**. The support member **6022** is fixed to a device body **2**.

FIGS. **22**A and **22**B are diagrams illustrating a state of a swing of the insertion member **6021** of the cover tape pre-process unit **602**. The support member **6022** may be disposed on the upper face of the cover member **7** which is connected to the downstream end **60211***a* in the tape feeding direction H of the base part **60211** of the insertion member **6021**. In this case, the support member **6022** supports the insertion member **6021** through the cover member **7**.

The insertion member **6021** may be supported by the support member **6022** through the cover member **7** swingably around a predetermined axis J**1** extending in the width direction of the second path part **52** of the travel path **5** (the X-axis direction). Accordingly, for example, when the com-

ponent storage tape **100** travels on the travel path **5** while bending, the insertion member **6021** which is inserted between the cover tape **102** and the carrier tape **101** is swingable in response to the bending of the component storage tape **100**. Thus, it is possible to stably prevent contact of the tip part **60212** of the insertion member **6021** with the storage part connecting region part **101***c* in the carrier tape **101**.

FIGS. **23**A and **23**B are diagrams illustrating the cover member **7** included in the component supply device **10** according to the second embodiment. The cover member **7** included in the component supply device **10** according to the second embodiment may be configured in a manner similar to the cover member **7** of the component supply device **1** according to the first embodiment described above. That is, the cover member **7** included in the component supply device **10** desirably has flexibility. Further, the cover member **7** may include a film member having a sheet-like shape as illustrated in FIG. **23**A. Further, the cover member **7** may also include a plurality of linear members which are arrayed at predetermined intervals in the width direction of the travel path **5** (the X-axis direction) as illustrated in FIG. **23**B.

The component supply device according to the embodiments of the present disclosure has been described above. However, the present disclosure is not limited thereto, and, for example, modifications as described below can be employed.

In the above embodiment, one direction in which the first path part **51** on which the cover tape raising unit **61** is disposed on the travel path **5** is inclined in the Z-axis direction (the first direction, the upper-lower direction) from the upstream side toward the downstream side in the tape feeding direction H is the lower direction (−Z direction). However, the present disclosure is not limited to this configuration. The one direction in which the first path part **51** on which the cover tape raising unit **61** is disposed is inclined in the Z-axis direction (the first direction, the upper-lower direction) from the upstream side toward the downstream side in the tape feeding direction H may be the upper direction (the +Z direction).

Further, in the above embodiment, the cover tape preprocess unit **62** includes the insertion member **621** and the cover tape cutting member **622** as separate members. However, the present disclosure is not limited to this configuration. The holding part **6222** of the cover tape cutting member **622** may have a function of the insertion member **621**. In this case, a structure in which the holding part **6222** and the insertion member **621** are integrally formed serves as an insertion member.

Note that the specific embodiments described above mainly include the disclosure having the following configuration.

A component supply device according to one aspect of the present disclosure supplies components to a component extracting position using a component storage tape, the component storage tape including a carrier tape including a plurality of component storage parts arrayed at predetermined intervals for storing the components and a cover tape stuck to the carrier tape to cover the component storage parts. The component supply device includes a tape feeding unit that feeds the component storage tape toward the component extracting position in a tape feeding direction along an array direction of the component storage parts, a tape travel path forming unit that forms a travel path leading to the component extracting position for the component storage tape fed by the tape feeding unit, and a component exposing unit that is disposed on the travel path and exposes the components inside the component storage parts of the component storage tape traveling on the travel path. The travel path includes a first path part including a slope part, the slope part being inclined to one direction side in a first direction perpendicular to a width direction of the travel path and the tape feeding direction from an upstream side toward a downstream side in the tape feeding direction. The component exposing unit includes a cover tape raising unit that performs a raising process for raising the cover tape of the component storage tape with respect to the carrier tape to expose the components by coming into contact with the cover tape. The cover tape raising unit is disposed on the first path part on the travel path.

According to the component supply device, in the travel path formed from the tape travel path forming unit, the first path part on which the cover tape raising unit is disposed includes the slope part, the slope part being inclined to one direction side in the first direction perpendicular to the width direction of the travel path and the tape feeding direction from the upstream side toward the downstream side in the tape feeding direction. Accordingly, it is possible to increase the travel distance of the component storage tape when the component storage tape travels on the first path part on the travel path and passes through the cover tape raising unit as compared to a case where, for example, the cover tape raising unit is disposed on a travel path horizontally extending in the tape feeding direction.

Further, the first path part is not configured in such a manner that the most upstream end and the most downstream end in the tape feeding direction are located at the same height position like the above conventional technique. Thus, in the cover tape raised by the cover tape raising unit, the generation of the tensile stress directing from the downstream end in the tape feeding direction toward the raising starting point (the starting point of the contact between the cover tape and the cover tape raising unit) is prevented. Thus, it is possible to prevent the buckling deformation of the carrier tape, the buckling deformation being caused by the tensile stress of the cover tape, during the raising process for the cover tape by the cover tape raising unit. Thus, an excellent traveling performance of the component storage tape is maintained, and the components can be efficiently supplied toward the component extracting position.

Further, in the component supply device having the configuration capable of preventing the buckling deformation of the carrier tape during the raising process for the cover tape, it is possible to reduce the length in the tape feeding direction of the first path part on which the cover tape raising unit is disposed, that is, the length in the tape feeding direction from the most upstream end to the most downstream end of the first path part. Thus, the component supply device can be downsized.

In the above component supply device, the one direction in the first direction is a lower direction in an upper-lower direction, and the first path part includes, when viewed in the width direction of the travel path, a first region formed in a shape extending along a first virtual curve projecting in an upper direction, and a second region continuous with the downstream side in the tape feeding direction of the first region and formed in a shape extending along a second virtual curve projecting in the lower direction. The cover tape raising unit is disposed in such a manner that a most upstream end in the tape feeding direction as the starting point of the contact with the cover tape is located on or near a boundary line between the first region and the second region in the first path part.

In this aspect, in the first path part viewed in the width direction of the travel path, the first region extending along the first virtual curve and the second region extending along the second virtual curve are curved in different directions with respect to the first direction (the upper-lower direction) and have opposite signs of the curvature. When the component storage tape travels along the first path part as described above, a force of bending acts on the component storage tape in opposite directions with respect to the first direction (the upper-lower direction) between when the component storage tape passes through the first region and when the component storage tape passes through the second region. Thus, for example, in the first path part, when the cover tape raising unit is disposed across the first region and the second region, there is a possibility that the stability of the raising process for the cover tape by the cover tape raising unit is reduced.

Thus, the cover tape raising unit is disposed in such a manner that the most upstream end in the tape feeding direction as the starting point of the contact with the cover tape is located on or near the boundary line between the first region and the second region in the first path part. In such a configuration, since the most upstream end of the cover tape raising unit is located on or near the boundary line between the first region and the second region, the cover tape raising unit is not located across the first region and the second region, but located in the second region. Thus, the reduction in the stability of the raising process for the cover tape by the cover tape raising unit is prevented.

In the above component supply device, a difference value (L−d) between a length L of an arc and a length d of a chord in a sector defined by a virtual circular arc extending along the second virtual curve is set to be larger than a threshold T defined by the above equation (I).

In this aspect, during the raising process for the cover tape by the cover tape raising unit which is disposed on the second region of the first path part, it is possible to more reliably prevent the buckling deformation of the carrier tape, the buckling deformation being caused by the tensile stress of the cover tape.

In the above component supply device, the travel path formed from the tape travel path forming unit further includes a second path part continuous with the upstream side in the tape feeding direction of the first path part. The tape feeding unit includes a first feeding unit that is disposed on an upstream end in the tape feeding direction of the second path part and that feeds the component storage tape with a tip of the component storage tape being a free end to cause the component storage tape to travel on the second path part and the first path part. The component exposing unit further includes a cover tape pre-process unit that is disposed on the second path part on the travel path away from the cover tape raising unit and that performs a pre-process for separating the cover tape from the carrier tape on one end in a width direction of the component storage tape or cutting the cover tape prior to the raising process by the cover tape raising unit.

In this aspect, the cover tape pre-process unit performs the pre-process for separating the cover tape from the carrier tape or cutting the cover tape prior to the raising process for the cover tape by the cover tape raising unit. Accordingly, the cover tape raising unit smoothly comes into contact with the cover tape of the component storage tape, and the raising process for the cover tape by the cover tape raising unit is smoothly performed.

Further, the component storage tape is fed by the first feeding unit with the tip of the component storage tape being a free end and travels on the second path part and the first path part from the upstream side toward the downstream side of the travel path. Here, the cover tape pre-process unit is disposed on the second path part away from the cover tape raising unit which is disposed on the first path part. Thus, when the component storage tape travels on the second path part on the upstream side of the first path part in the travel path and passes through the cover tape pre-process unit, the raising process has not yet been performed on the cover tape of the component storage tape. As a result, in the component storage tape traveling on the second path part on which the cover tape pre-process unit is disposed, it is possible to prevent the buckling deformation of the carrier tape, the buckling deformation being caused by the tensile stress of the cover tape associated with the raising process.

In the above component supply device, the travel path formed from the tape travel path forming unit further includes a third path part continuous with the downstream side in the tape feeding direction of the first path part, the third path part leading to the component extracting position. The tape feeding unit further includes a second feeding unit that is disposed on an upstream end in the tape feeding direction of the third path part, and that receives the component storage tape fed by the first feeding unit, the component storage tape traveling on the first path part, and feeds the component storage tape toward the component extracting position to cause the component storage tape to travel on the third path part. The component exposing unit further includes a cover tape post-process unit that is disposed on the third path part on the travel path and that performs a post-process for spreading out the cover tape raised by the cover tape raising unit in the width direction of the component storage tape.

In this aspect, the component storage tape after the raising process for the cover tape by the cover tape raising unit is fed to the third path part on the downstream side of the first path part in the travel path by the second feeding unit in the tape feeding unit. The cover tape post-process unit is disposed on the third path part. The cover tape post-process unit performs the post-process for spreading out the cover tape raised by the cover tape raising unit in the width direction of the component storage tape. Accordingly, an exposed degree of the component inside the component storage part of the component storage tape increases. Thus, it is possible to improve a extracting performance for the component at the component extracting position.

As described above, according to the present disclosure, it is possible to provide the component supply device that supplies components stored in the component storage tape to the component extracting position, the component supply device being capable of efficiently supplying the components.

What is claimed is:

1. A component supply device that supplies components to a component extracting position using a component storage tape, the component storage tape including a carrier tape including a plurality of component storage parts arrayed at predetermined intervals for storing the components and a cover tape stuck to the carrier tape to cover the component storage parts, the component supply device comprising:

a tape feeder configured to feed the component storage tape toward the component extracting position in a tape feeding direction along an array direction of the component storage parts;

a tape travel path former configured to form a travel path leading to the component extracting position for the component storage tape fed by the tape feeder; and

a component exposer that is disposed on the travel path and configured to expose the components inside the component storage parts of the component storage tape traveling on the travel path,

wherein the travel path includes a first path part including a slope part, the slope part being inclined to one direction side in a first direction perpendicular to a width direction of the travel path and the tape feeding direction from an upstream side toward a downstream side in the tape feeding direction, the slope part being configured in such a manner that a most upstream end and a most downstream end in the tape feeding direction are located at different height positions,

the component exposer includes a cover tape raiser configured to perform a raising process for raising the cover tape of the component storage tape with respect to the carrier tape to expose the components by coming into contact with the cover tape, and

the cover tape raiser is disposed on the first path part on the travel path.

2. The component supply device according to claim **1**, wherein

the one direction in the first direction is a lower direction in an upper-lower direction,

the first path part is configured in such a manner that the most downstream end in the tape feeding direction is located on a lower side relative to the most upstream end and includes, when viewed in the width direction of the travel path,

a first region formed in a shape extending along a first virtual curve projecting in an upper direction, and

a second region continuous with the downstream side in the tape feeding direction of the first region and formed in a shape extending along a second virtual curve projecting in the lower direction, and

the cover tape raiser is disposed in such a manner that a most upstream end in the tape feeding direction as a starting point of the contact with the cover tape is located on or near a boundary line between the first region and the second region in the first path part.

3. The component supply device according to claim **2**, wherein a difference value (L-d) between a length L of an arc and a length d of a chord in a sector defined by a virtual circular arc extending along the second virtual curve is set to be larger than a threshold T defined by the following equation (I),

$$T=2C\cdot W^2/(C^2+W^2) \quad (I)$$

where "C" denotes a length along the second region of the first path part in the cover tape raiser and "W" denotes a distance in the width direction of the travel path between the most upstream end in the tape feeding direction as the starting point of the contact with the cover tape and the most downstream end in the tape feeding direction as an end point of the contact with the cover tape in the cover tape raiser.

4. The component supply device according to claim **3**, wherein

the travel path formed from the tape travel path former further includes a second path part continuous with the upstream side in the tape feeding direction of the first path part,

the tape feeder includes a first feeder that is disposed on an upstream end in the tape feeding direction of the second path part and that is configured to feed the component storage tape with a tip of the component storage tape being a free end to cause the component storage tape to travel on the second path part and the first path part, and

the component exposer further includes a cover tape pre-processor that is disposed on the second path part on the travel path away from the cover tape raiser and that is configured to perform a pre-process for separating the cover tape from the carrier tape on one end in a width direction of the component storage tape or cutting the cover tape prior to the raising process by the cover tape raiser.

5. The component supply device according to claim **4**, wherein

the travel path formed from the tape travel path former further includes a third path part continuous with the downstream side in the tape feeding direction of the first path part, the third path part leading to the component extracting position,

the tape feeder further includes a second feeder that is disposed on an upstream end in the tape feeding direction of the third path part, and that is configured to receive the component storage tape fed by the first feeder, the component storage tape traveling on the first path part, and feed the component storage tape toward the component extracting position to cause the component storage tape to travel on the third path part, and

the component exposer further includes a cover tape post-processor that is disposed on the third path part on the travel path and that is configured to perform a post-process for spreading out the cover tape raised by the cover tape raiser in the width direction of the component storage tape.

6. The component supply device according to claim **2**, wherein

the travel path formed from the tape travel path former further includes a second path part continuous with the upstream side in the tape feeding direction of the first path part,

the tape feeder includes a first feeder that is disposed on an upstream end in the tape feeding direction of the second path part and that is configured to feed the component storage tape with a tip of the component storage tape being a free end to cause the component storage tape to travel on the second path part and the first path part, and

the component exposer further includes a cover tape pre-processor that is disposed on the second path part on the travel path away from the cover tape raiser and that is configured to perform a pre-process for separating the cover tape from the carrier tape on one end in a width direction of the component storage tape or cutting the cover tape prior to the raising process by the cover tape raiser.

7. The component supply device according to claim **6**, wherein

the travel path formed from the tape travel path former further includes a third path part continuous with the downstream side in the tape feeding direction of the first path part, the third path part leading to the component extracting position,

the tape feeder further includes a second feeder that is disposed on an upstream end in the tape feeding direction of the third path part, and that is configured to receive the component storage tape fed by the first feeder, the component storage tape traveling on the first path part, and feed the component storage tape toward

the component extracting position to cause the component storage tape to travel on the third path part, and

the component exposer further includes a cover tape post-processor that is disposed on the third path part on the travel path and that is configured to perform a post-process for spreading out the cover tape raised by the cover tape raiser in the width direction of the component storage tape.

8. The component supply device according to claim **1**, wherein

the travel path formed from the tape travel path former further includes a second path part continuous with the upstream side in the tape feeding direction of the first path part,

the tape feeder includes a first feeder that is disposed on an upstream end in the tape feeding direction of the second path part and that is configured to feed the component storage tape with a tip of the component storage tape being a free end to cause the component storage tape to travel on the second path part and the first path part, and

the component exposer further includes a cover tape pre-processor that is disposed on the second path part on the travel path away from the cover tape raiser and that is configured to perform a pre-process for separating the cover tape from the carrier tape on one end in a width direction of the component storage tape or cutting the cover tape prior to the raising process by the cover tape raiser.

9. The component supply device according to claim **8**, wherein

the travel path formed from the tape travel path former further includes a third path part continuous with the downstream side in the tape feeding direction of the first path part, the third path part leading to the component extracting position,

the tape feeder further includes a second feeder that is disposed on an upstream end in the tape feeding direction of the third path part, and that is configured to receive the component storage tape fed by the first feeder, the component storage tape traveling on the first path part, and feed the component storage tape toward the component extracting position to cause the component storage tape to travel on the third path part, and

the component exposer further includes a cover tape post-processor that is disposed on the third path part on the travel path and that is configured to perform a post-process for spreading out the cover tape raised by the cover tape raiser in the width direction of the component storage tape.

10. The component supply device according to claim **1**, wherein the tape travel path former includes a cover having flexibility, the cover extending up to the component extracting position along the travel path, the cover being inserted between the cover tape and the carrier tape of the component storage tape traveling on the travel path to cover at least a part of each of the component storage parts.

11. The component supply device according to claim **10**, wherein

the one direction in the first direction is a lower direction in an upper-lower direction,

the first path part is configured in such a manner that the most downstream end in the tape feeding direction is located on a lower side relative to the most upstream end and includes, when viewed in the width direction of the travel path,

a first region formed in a shape extending along a first virtual curve projecting in an upper direction, and

a second region continuous with the downstream side in the tape feeding direction of the first region and formed in a shape extending along a second virtual curve projecting in the lower direction, and

the cover tape raiser is disposed in such a manner that a most upstream end in the tape feeding direction as a starting point of the contact with the cover tape is located on or near a boundary line between the first region and the second region in the first path part.

12. The component supply device according to claim **11**, wherein

the travel path formed from the tape travel path former further includes a second path part continuous with the upstream side in the tape feeding direction of the first path part,

the tape feeder includes a first feeder that is disposed on an upstream end in the tape feeding direction of the second path part and that is configured to feed the component storage tape with a tip of the component storage tape being a free end to cause the component storage tape to travel on the second path part and the first path part, and

the component exposer further includes a cover tape pre-processor that is disposed on the second path part on the travel path away from the cover tape raiser and that is configured to perform a pre-process for separating the cover tape from the carrier tape on one end in a width direction of the component storage tape or cutting the cover tape prior to the raising process by the cover tape raiser.

13. The component supply device according to claim **12**, wherein

the travel path formed from the tape travel path former further includes a third path part continuous with the downstream side in the tape feeding direction of the first path part, the third path part leading to the component extracting position,

the tape feeder further includes a second feeder that is disposed on an upstream end in the tape feeding direction of the third path part, and that is configured to receive the component storage tape fed by the first feeder, the component storage tape traveling on the first path part, and feed the component storage tape toward the component extracting position to cause the component storage tape to travel on the third path part, and

the component exposer further includes a cover tape post-processor that is disposed on the third path part on the travel path and that is configured to perform a post-process for spreading out the cover tape raised by the cover tape raiser in the width direction of the component storage tape.

14. The component supply device according to claim **10**, wherein

the travel path formed from the tape travel path former further includes a second path part continuous with the upstream side in the tape feeding direction of the first path part,

the tape feeder includes a first feeder that is disposed on an upstream end in the tape feeding direction of the second path part and that is configured to feed the component storage tape with a tip of the component storage tape being a free end to cause the component storage tape to travel on the second path part and the first path part, and

the component exposer further includes a cover tape pre-processor that is disposed on the second path part on the travel path away from the cover tape raiser and that is configured to perform a pre-process for separating the cover tape from the carrier tape on one end in a width direction of the component storage tape or cutting the cover tape prior to the raising process by the cover tape raiser.

15. The component supply device according to claim **14**, wherein

the travel path formed from the tape travel path former further includes a third path part continuous with the downstream side in the tape feeding direction of the first path part, the third path part leading to the component extracting position,

the tape feeder further includes a second feeder that is disposed on an upstream end in the tape feeding direction of the third path part, and that is configured to receive the component storage tape fed by the first feeder, the component storage tape traveling on the first path part, and feed the component storage tape toward the component extracting position to cause the component storage tape to travel on the third path part, and

the component exposer further includes a cover tape post-processor that is disposed on the third path part on the travel path and that is configured to perform a post-process for spreading out the cover tape raised by the cover tape raiser in the width direction of the component storage tape.

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